C 8

```
DDDDDDDDDDDD     RRRRRRRRRRRR        IIIIIIIII     VVV         VVV  EEEEEEEEEEEEEEE  RRRRRRRRRRRR
DDDDDDDDDDDD     RRRRRRRRRRRR        IIIIIIIII     VVV         VVV  EEEEEEEEEEEEEEE  RRRRRRRRRRRR
DDDDDDDDDDDD     RRRRRRRRRRRR        IIIIIIIII     VVV         VVV  EEEEEEEEEEEEEEE  RRRRRRRRRRRR
DDD         DDD  RRR         RRR        III        VVV         VVV  EEE              RRR         RRR
DDD         DDD  RRR         RRR        III        VVV         VVV  EEE              RRR         RRR
DDD         DDD  RRR         RRR        III        VVV         VVV  EEE              RRR         RRR
DDD         DDD  RRR         RRR        III        VVV         VVV  EEE              RRR         RRR
DDD         DDD  RRR         RRR        III        VVV         VVV  EEE              RRR         RRR
DDD         DDD  RRR         RRR        III        VVV         VVV  EEE              RRR         RRR
DDD         DDD  RRRRRRRRRRRR           III        VVV         VVV  EEEEEEEEEEEE     RRRRRRRRRRRR
DDD         DDD  RRRRRRRRRRRR           III        VVV         VVV  EEEEEEEEEEEE     RRRRRRRRRRRR
DDD         DDD  RRRRRRRRRRRR           III        VVV         VVV  EEEEEEEEEEEE     RRRRRRRRRRRR
DDD         DDD  RRR   RRR              III        VVV         VVV  EEE              RRR   RRR
DDD         DDD  RRR   RRR              III        VVV         VVV  EEE              RRR   RRR
DDD         DDD  RRR   RRR              III        VVV         VVV  EEE              RRR   RRR
DDD         DDD  RRR      RRR           III           VVV   VVV     EEE              RRR      RRR
DDD         DDD  RRR      RRR           III           VVV   VVV     EEE              RRR      RRR
DDD         DDD  RRR      RRR           III           VVV   VVV     EEE              RRR      RRR
DDDDDDDDDDDD     RRR         RRR     IIIIIIIII           VVV        EEEEEEEEEEEEEEE  RRR         RRR
DDDDDDDDDDDD     RRR         RRR     IIIIIIIII           VVV        EEEEEEEEEEEEEEE  RRR         RRR
DDDDDDDDDDDD     RRR         RRR     IIIIIIIII           VVV        EEEEEEEEEEEEEEE  RRR         RRR
```

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FILEID**DRDRIVER

```
DDDDDDDD    RRRRRRRR    DDDDDDDD    RRRRRRRR      IIIIII    VV      VV  EEEEEEEEEE  RRRRRRRR
DDDDDDDD    RRRRRRRR    DDDDDDDD    RRRRRRRR      IIIIII    VV      VV  EEEEEEEEEE  RRRRRRRR
DD      DD  RR      RR  DD      DD  RR      RR      II      VV      VV  EE          RR      RR
DD      DD  RR      RR  DD      DD  RR      RR      II      VV      VV  EE          RR      RR
DD      DD  RR      RR  DD      DD  RR      RR      II      VV      VV  EE          RR      RR
DD      DD  RR      RR  DD      DD  RR      RR      II      VV      VV  EE          RR      RR
DD      DD  RRRRRRRR    DD      DD  RRRRRRRR        II      VV      VV  EEEEEEEE    RRRRRRRR
DD      DD  RRRRRRRR    DD      DD  RRRRRRRR        II      VV      VV  EEEEEEEE    RRRRRRRR
DD      DD  RR  RR      DD      DD  RR  RR          II      VV      VV  EE          RR  RR
DD      DD  RR  RR      DD      DD  RR  RR          II      VV      VV  EE          RR  RR
DD      DD  RR    RR    DD      DD  RR    RR        II        VV  VV    EE          RR    RR        ....
DD      DD  RR    RR    DD      DD  RR    RR        II        VV  VV    EE          RR    RR        ....
DDDDDDDD    RR      RR  DDDDDDDD    RR      RR    IIIIII        VV      EEEEEEEEEE  RR      RR      ....
DDDDDDDD    RR      RR  DDDDDDDD    RR      RR    IIIIII        VV      EEEEEEEEEE  RR      RR      ....

LL            IIIIII      SSSSSSSS
LL            IIIIII      SSSSSSSS
LL              II      SS
LL              II      SS
LL              II      SS
LL              II      SS
LL              II        SSSSSS
LL              II        SSSSSS
LL              II              SS
LL              II              SS
LL              II              SS
LL              II              SS
LLLLLLLLLL    IIIIII    SSSSSSSS
LLLLLLLLLL    IIIIII    SSSSSSSS
```

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```
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```

```
0000          .TITLE  DRDRIVER - RM03/RM05/RM80/RP07 DISK DRIVER
0000          .IDENT  'V04-001'
0000
0000    ;
0000    ;****************************************************************************
0000    ;*                                                                          *
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0000    ;*                                                                          *
0000    ;*                                                                          *
0000    ;****************************************************************************
0000    ;
0000    ; D. N. CUTLER, LEN KAWELL 23-NOV-77
0000    ;
0000    ;  MODIFIED BY:
0000    ;
0000    ;       V04-001 PRD0112         Paul R. DeStefano       06-Sep-1984
0000    ;               Modify ECC routine to allow for RP07's handling of
0000    ;               HCRC errors as class A errors when HCI is set.
0000    ;
0000    ;               Add sanity check to offset recovery routine to insure
0000    ;               that there is data to be transferred before offset
0000    ;               recovery is performed.
0000    ;
0000    ;       V03-016 RAS0300         Ron Schaefer            27-Apr-1984
0000    ;               Add DEV$M_NNM characteristic to DECHAR2 so that these
0000    ;               devices will have the "node$" prefix.
0000    ;
0000    ;       V03-015 PRD0081         Paul R. DeStefano       19-Mar-1984
0000    ;               For dual ported drives, make sure the port isn't
0000    ;               reseized by the time we come off the I/O fork queue.
0000    ;
0000    ;       V03-014 PRD0048         Paul R. DeStefano       01-Feb-1984
0000    ;               Fix context used in TIMEWAIT macro when referencing
0000    ;               device registers.
0000    ;
0000    ;       V03-013 PRD0036         Paul R. DeStefano       09-Sep-1983
0000    ;               Added EXE$LCLDSKVALID to function decision table.
0000    ;
0000    ;       V03-012 ROW0211         Ralph O. Weber          16-AUG-1983
0000    ;               Change device-dependent UCB definition base from UCB$W_BCR+2
0000    ;               to UCB$K_LCL_DISK_LENGTH.
```

```
0000    ;
0000    ;       V03-011 WMC0001         Wayne Cardoza           09-Aug-1983
0000    ;               Missing G^.
0000    ;
0000    ;       V03-010 KDM0060         Kathleen D. Morse       14-Jul-1983
0000    ;               Replace reference to IPR TODR with call to cpu-dependent
0000    ;               routine, EXE$READ_TODR.
0000    ;               Add $DEVDEF.
0000    ;
0000    ;       V03-009 PRD0027         Paul R. DeStefano       17-Jun-1983
0000    ;               Modified EXFNC routine to bypass setting of offset mode
0000    ;               for RP07's to prevent RP07 microcode hang and system crash.
0000    ;
0000    ;       V03-008 PRD0023         Paul R. DeStefano       05-May-1983
0000    ;               Modified ERROR routine to attempt to clear a drive
0000    ;               unsafe condidtion.
0000    ;
0000    ;       V03-007 PRD53302        Paul R. DeStefano       05-May-1983
0000    ;       ECO 02  Modified RETRYERR routine to issue a Drive Clear before
0000    ;               retrying a function.  Modified FUNCXT routine to issue
0000    ;               a Drive Clear function before releasing the drive.
0000    ;
0000    ;       V03-006 PRD0018         Paul R. DeStefano       26-Apr-1983
0000    ;               Modified FATALERR routine to return SS$_PARITY only for
0000    ;               errors that possibly indicate bad media.  All other error
0000    ;               conditions which formerly returned SS$_PARITY now return
0000    ;               SS$_CNTLERR.
0000    ;
0000    ;       V03-005 PRD0015         Paul R. DeStefano       26-Apr-1983
0000    ;               Modified ECC correction logic so that ECC is only applied
0000    ;               when there is single bit ECC correctable error, or if there
0000    ;               is a multiple bit ECC correctable error and the error cannot
0000    ;               be corrected using retries.
0000    ;
0000    ;       V03-004 ROW47161        Ralph O. Weber          16-SEP-1982
0000    ;       ECO 01  Enhance ECC recovery logic to prevent bytes transfered counts
0000    ;               which are not exact multiples of 512 from causing transfer
0000    ;               parameters from being incorrectly updated.  Because a non-512-
0000    ;               intergal bytes transfered counts indicates an incomplete
0000    ;               transfer of the last block, this change also prevents ECC
0000    ;               corrections when such bytes transfered counts are encountered.
0000    ;
0000    ;       V03-003 KDM0002         Kathleen D. Morse       28-Jun-1982
0000    ;               Added $DCDEF, $DYNDEF, and $SSDEF.
0000    ;
0000    ;       V03-002 KTA0100         Kerbey T. Altmann               07-Jun-1982
0000    ;               Add code to set UCB$L_MEDIA_ID.
0000    ;
0000    ;
0000    ; RM03/RM05/RM80/RP07 DISK DRIVER
0000    ;
0000    ; MACRO LIBRARY CALLS
0000    ;
0000
0000            $CRBDEF                                 ;DEFINE CRB OFFSETS
0000            $DCDEF                                  ;DEFINE DEVICE CLASSES
0000            $DDBDEF                                 ;DEFINE DDB OFFSETS
```

```
0000              $DEVDEF                                 ;DEFINE DEVICE CHARACTERISTICS
0000              $DPTDEF                                 ;DEFINE DPT OFFSETS
0000              $DYNDEF                                 ;DEFINE DYNAMIC DATA STRUCTURE TYPES
0000              $EMBDEF                                 ;DEFINE EMB OFFSETS
0000              $IDBDEF                                 ;DEFINE IDB OFFSETS
0000              $IODEF                                  ;DEFINE I/O FUNCTION CODES
0000              $IRPDEF                                 ;DEFINE IRP OFFSETS
0000              $MBADEF                                 ;DEFINE MBA REGISTER OFFSETS
0000              $PRDEF                                  ;DEFINE PROCESSOR REGISTER NUMBERS
0000              $SSDEF                                  ;DEFINE SYSTEM STATUS CODES
0000              $UCBDEF                                 ;DEFINE UCB OFFSETS
0000              $VECDEF                                 ;DEFINE INTERRUPT DISPATCH VECTOR OFFSETS
0000
0000      ;
0000      ; LOCAL MACROS
0000      ;
0000      ; EXECUTE FUNCTION AND BRANCH ON RETRIABLE ERROR CONDITION
0000      ;
0000
0000              .MACRO  EXFUNC BDST,FCODE
0000                      .IF NB  FCODE
0000                      MOVZBL  #CD'FCODE,R0
0000                      .ENDC
0000                      BSBW    FEX
0000                      .SIGNED_WORD BDST-.-2
0000              .ENDM
0000
0000      ;
0000      ; GENERATE FUNCTION TABLE ENTRY AND CASE TABLE INDEX SYMBOL
0000      ;
0000
0000              .MACRO  GENF FCODE
0000                      CD'FCODE=.-FTAB
0000                      .BYTE   FCODE!RM_CS1_M_GO
0000              .ENDM
0000
0000      ;
0000      ; LOCAL SYMBOLS
0000      ;
0000      ; MASSBUS REGISTER OFFSETS
0000      ;
0000
0000              $DEFINI RM
0000
0000      $DEF    RM_CS1          .BLKL   1               ;DRIVE CONTROL REGISTER
0004              _VIELD  RM_CS1,0,<-                     ; DRIVE CONTROL REGISTER BIT DEFINITIONS
0004                      <GO,,M>,-                       ; GO BIT
0004                      <FCODE,5>-                      ; FUNCTION CODE
0004              >                                       ;
0004      $DEF    RM_DS           .BLKL   1               ;DRIVE STATUS REGISTER
0008              _VIELD  RM_DS,0,<-                      ; DRIVE STATUS REGISTER BIT DEFINITIONS
0008                      <OM,,M>,-                       ; OFFSET MODE
0008                      <,5>,-                          ; RESERVED BITS
0008                      <VV,,M>,-                       ; VOLUME VALID
0008                      <DRY,,M>,-                      ; DRIVE READY
0008                      <DPR,,M>,-                      ; DRIVE PRESENT
0008                      <PGM,,M>,-                      ; PROGRAMMABLE
```

```
0008                        <LST,,M>,-                  ; LAST SECTOR TRANSFERED
0008                        <WRL,,M>,-                  ; DRIVE WRITE LOCKED
0008                        <MOL,,M>,-                  ; MEDIUM ONLINE
0008                        <PIP,,M>,-                  ; POSITIONING IN PROGRESS
0008                        <ERR,,M>,-                  ; COMPOSITE ERROR
0008                        <ATA,,M>-                   ; ATTENTION ACTIVE
0008               >                                    ;
0008     $DEF      RM_ER1            .BLKL    1         ;ERROR REGISTER 1
000C               _VIELD   RM_ER1,0,<-                 ; ERROR REGISTER 1 BIT DEFINITIONS
000C                        <ILF,,M>,-                  ; ILLEGAL FUNCTION
000C                        <ILR,,M>,-                  ; ILLEGAL REGISTER
000C                        <RMR,,M>,-                  ; REGISTER MODIFY REFUSED
000C                        <PAR,,M>,-                  ; PARITY ERROR
000C                        <FER,,M>,-                  ; FORMAT ERROR
000C                        <WCF,,M>,-                  ; WRITE CLOCK FAIL
000C                        <ECH,,M>,-                  ; ECC HARD ERROR
000C                        <HCE,,M>,-                  ; HEADER COMPARE ERROR
000C                        <HCRC,,M>,-                 ; HEADER CRC ERROR
000C                        <AOE,,M>,-                  ; ADDRESS OVERFLOW ERROR
000C                        <IAE,,M>,-                  ; ILLEGAL ADDRESS ERROR
000C                        <WLE,,M>,-                  ; WRITE LOCK ERROR
000C                        <DTE,,M>,-                  ; DRIVE TIMING ERROR
000C                        <OPI,,M>,-                  ; OPERATION INCOMPLETE
000C                        <UNS,,M>,-                  ; DRIVE UNSAFE
000C                        <DCK,,M>-                   ; DATA CHECK ERROR
000C               >                                    ;
000C     $DEF      RM_MR             .BLKL    1         ;MAINTENANCE REGISTER
0010               _VIELD   RM_MR,0,<-                  ; MAINTENANCE REGISTER DEFINITIONS
0010                        <PAR,8>,-                   ; DIAGNOSTIC PARAMETER
0010                        <RTN,7>,-                   ; DIAGNOSTIC ROUTINE NUMBER
0010                        <DM,,M>,-                   ; DIAGNOSTIC MODE
0010               >                                    ;
0010     $DEF      RM_AS             .BLKL    1         ;ATTENTION SUMMARY REGISTER
0014     $DEF      RM_DA             .BLKL    1         ;DESIRED SECTOR/TRACK ADDRESS REGISTER
0018               _VIELD   RM_DA,0,<-                  ; DESIRED ADDRESS FIELD DEFINITIONS
0018                        <SA,5>,-                    ; DESIRED SECTOR ADDRESS
0018                        <,3>,-                      ; RESERVED BITS
0018                        <TA,5>-                     ; DESIRED TRACK ADDRESS
0018               >                                    ;
0018     $DEF      RM_DT             .BLKL    1         ;DRIVE TYPE REGISTER
001C               _VIELD   RM_DT,0,<-                  ; DRIVE TYPE REGISTER FIELD DEFINITIONS
001C                        <DTN,9>,-                   ; DRIVE TYPE NUMBER
001C                        <,2>,-                      ; RESERVED BITS
001C                        <DRQ,,M>-                   ; DRIVE REQUEST REQUIRED
001C               >                                    ;
001C     $DEF      RM_LA             .BLKL    1         ;LOOKAHEAD REGISTER
0020     $DEF      RM_SN             .BLKL    1         ;SERIAL NUMBER REGISTER
0024     $DEF      RM_OF             .BLKL    1         ;OFFSET REGISTER
0028               _VIELD   RM_OF,0,<-                  ; OFFSET REGISTER BIT DEFINITIONS
0028                        <OFF,8>,-                   ; OFFSET VALUE
0028                        <,1>,-                      ; RESERVED
0028                        <SSEI,,M>,-                 ; SKIP SECTOR INHIBIT (RM80)
0028                        <HCI,,M>,-                  ; HEADER COMPARE INHIBIT
0028                        <ECI,,M>,-                  ; ECC INHIBIT (avoid using this bit)
0028                        <FMT,,M>,-                  ; 16-BIT FORMAT
0028                        <,1>,-                      ; RESERVED
0028                        <MTD,,M>,-                  ; MOVE TRACK DESCRIPTOR
```

```
          0028                     <CMO,,M>-                ; COMMAND MODIFIER
          0028                >                             ;
          0028  $DEF     RM_DC              .BLKL    1      ;DESIRED CYLINDER ADDRESS
          002C  $DEF     RM_UNUSED          .BLKL    1      ;UNUSED
          0030  $DEF     RM_MR2             .BLKL    1      ;MAINTENANCE REGISTER 2
          0034  $DEF     RM_ER2             .BLKL    1      ;ERROR REGISTER 2
          0038           _VIELD   RM_ER2,3,<-               ; ERROR REGISTER 2 BIT DEFINITIONS
          0038                     <DPE,,M>,-               ; DATA PARITY ERROR
          0038                     <,1>,-                   ; RESERVED BIT
          0038                     <SSE,,M>,-               ; SKIP SECTOR ERROR (RM80)
          0038                     <,1>,-                   ; RESERVED BIT
          0038                     <DVC,,M>,-               ; DEVICE CHECK ERROR
          0038                     <,2>,-                   ; RESERVED BITS
          0038                     <LBC,,M>,-               ; LOSS OF BIT CLOCK ERROR
          0038                     <LSC,,M>,-               ; LOSS OF SYSTEM CLOCK ERROR
          0038                     <IVC,,M>,-               ; INVALID COMMAND ERROR
          0038                     <OPE,,M>,-               ; OPERATOR PLUG ERROR
          0038                     <SKI,,M>,-               ; SEEK INCOMPLETE ERROR
          0038                     <BSE,,M>-                ; BAD SECTOR ERROR
          0038                >                             ;
          0038  $DEF     RM_EC1             .BLKL    1      ;ECC POSITION REGISTER
          003C            VIELD   RM_EC1,0,<<POS,13>>       ; ECC POSITION FIELD
          003C  $DEF     RM_EC2             .BLKL    1      ;ECC PATTERN REGISTER
          0040           _VIELD   RM_EC2,0,<<PAT,11>>       ; ECC PATTERN FIELD
          0040
          0040           $DEFEND RM
          0000
          0000  ;
          0000  ; DEFINE DEVICE DEPENDENT UNIT CONTROL BLOCK OFFSETS
          0000  ;
          0000
          0000           $DEFINI UCB
          0000
000000CC  0000  .=UCB$K_LCL_DISK_LENGTH                     ;Establish device-dependent UCB base
          00CC
          00CC  $DEF     UCB$L_DR_SR      .BLKL    1        ;SAVED MBA STATUS REGISTER
          00D0  $DEF     UCB$W_DR_ER2     .BLKW    1        ;SAVED ERROR REGISTER 2
          00D2  $DEF     UCB$W_DR_MR      .BLKW    1        ;MAINTENANCE REGISTER
          00D4  $DEF     UCB$B_DR_SSTS    .BLKB    1        ;SOFTWARE STATUS BYTE
          00D5           _VIELD   DR,0,<-                   ; SOFTWARE STATUS BIT DEFINITIONS
          00D5                     <DCK,,M>,-               ; DATACHECK IN PROGRESS
          00D5                     <OM,,M>,-                ; OFFSET MODE
          00D5                     <NOECC,,M>,-             ; Don't correct with ECC
          00D5                     <DUALPORT,,M>-           ; Drive has a dualport kit
          00D5                     <ECC_DEFER,,M>, -        ; Flag to indicate that ECC correction
          00D5                >                             ;  has been deferred until offset
          00D5                                              ;  retries are exhausted.
          00D5  $DEF     UCB$B_DR_ERL     .BLKB    1        ;ERROR LOGGING REGISTER FOR MED OFFLINE
          00D6  $DEF     UCB$W_DR_OFR     .BLKW    1        ;SAVED OFFSET REGISTER
          00D8  $DEF     UCB$L_DR_BCR     .BLKL    1        ; Saved (longword) MBA byte count reg.
000000DC  00DC  UCB$K_DR_LENGTH=.
          00DC
          00DC           $DEFEND UCB
          0000
          0000  ;
          0000  ; HARDWARE FUNCTION CODES
          0000  ;
```

```
         0000
00000000 0000  F_NOP=0*2                                 ;NO OPERATION
00000004 0000  F_SEEK=2*2                                ;SEEK CYLINDER
00000006 0000  F_RECAL=3*2                               ;RECALIBRATE
00000008 0000  F_DRVCLR=4*2                              ;DRIVE CLEAR
0000000A 0000  F_RELEASE=5*2                             ;RELEASE DRIVE
0000000C 0000  F_OFFSET=6*2                              ;OFFSET HEADS
0000000E 0000  F_RETCENTER=7*2                           ;RETURN TO CENTERLINE
00000010 0000  F_READPRESET=8*2                          ;READ IN PRESET
00000012 0000  F_PACKACK=9*2                             ;PACK ACKNOWLEDGE
00000018 0000  F_SEARCH=12*2                             ;SEARCH FOR SECTOR
00000018 0000  F_SEARCHA=12*2                            ;SEARCH AHEAD FOR SECTOR
0000001C 0000  F_DIAGNOSE=14*2                           ;DIAGNOSE DRIVE
00000028 0000  F_WRITECHECK=20*2                         ;WRITE CHECK DATA
0000002A 0000  F_WRITECHECKH=21*2                        ;WRITE CHECK HEADER AND DATA
00000030 0000  F_WRITEDATA=24*2                          ;WRITE DATA
00000032 0000  F_WRITEHEAD=25*2                          ;WRITE HEADER AND DATA
00000034 0000  F_WRITETRACKD=26*2                        ;WRITE TRACK DESCRIPTOR
00000038 0000  F_READDATA=28*2                           ;READ DATA
0000003A 0000  F_READHEAD=29*2                           ;READ HEADER AND DATA
0000003C 0000  F_READTRACKD=30*2                         ;READ TRACK DESCRIPTOR
00000000 0000  F_AVAILABLE=F_NOP                         ;AVAILABLE
         0000
         0000  ;
         0000  ; LOCAL DATA
         0000  ;
         0000  ; DRIVER PROLOGUE TABLE
         0000  ;
         0000
         0000          DPTAB   -                         ;DEFINE DRIVER PROLOGUE TABLE
         0000                  END=DR_END,-              ;END OF DRIVER
         0000                  ADAPTER=MBA,-             ;ADAPTER TYPE
         0000                  FLAGS=DPT$M_SVP,-         ;SYSTEM PAGE TABLE ENTRY REQUIRED
         0000                  UCBSIZE=UCB$K_DR_LENGTH,-         ;UCB size
         0000                  NAME=DRDRIVER             ;DRIVER NAME
         0038          DPT_STORE INIT                    ;CONTROL BLOCK INIT VALUES
         0038          DPT_STORE DDB,DDB$L_ACPD,L,<^A\F11\> ;DEFAULT ACP NAME
         003F          DPT_STORE DDB,DDB$L_ACPD+3,B,DDB$K_PACK ;ACP CLASS
         0043          DPT_STORE UCB,UCB$B_FIPL,B,8      ;FORK IPL
         0047          DPT_STORE UCB,UCB$L_DEVCHAR,L,- ;DEVICE CHARACTERISTICS
         0047                  <DEV$M_FOD-               ; FILES ORIENTED
         0047                  !DEV$M_DIR-               ; DIRECTORY STRUCTURED
         0047                  !DEV$M_AVL-               ; AVAILABLE
         0047                  !DEV$M_ELG-               ; ERROR LOGGING ENABLED
         0047                  !DEV$M_SHR-               ; SHAREABLE
         0047                  !DEV$M_IDV-               ; INPUT DEVICE
         0047                  !DEV$M_ODV-               ; OUTPUT DEVICE
         0047                  !DEV$M_RND>               ; RANDOM ACCESS
         004E          DPT_STORE UCB,UCB$L_DEVCHAR2,L,-; DEVICE CHARACTERISTICS
         004E                  <DEV$M_NNM>               ; PREFIX NAME WITH "node$"
         0055          DPT_STORE UCB,UCB$B_DEVCLASS,B,DC$_DISK ;DEVICE CLASS
         0059          DPT_STORE UCB,UCB$W_DEVBUFSIZ,W,512 ;DEFAULT BUFFER SIZE
         005E          DPT_STORE UCB,UCB$B_DIPL,B,21     ;DEVICE IPL
         0062          DPT_STORE UCB,UCB$B_ERTCNT,B,8    ;ERROR RETRY COUNT
         0066          DPT_STORE UCB,UCB$B_ERTMAX,B,8    ;MAX ERROR RETRY COUNT
         006A          DPT_STORE REINIT                  ;CONTROL BLOCK RE-INIT VALUES
         006A          DPT_STORE DDB,DDB$L_DDT,D,DR$DDT ;DDT ADDRESS
```

```
             006F          DPT_STORE END                        ;
             0000
             0000  ;
             0000  ; DRIVER DISPATCH TABLE
             0000  ;
             0000
             0000          DDTAB   DR,-                         ;DRIVER DISPATCH TABLE
             0000                  DR_STARTIO,-                 ;START I/O OPERATION
             0000                  DR_UNSOLNT,-                 ;UNSOLICITED INTERRUPT
             0000                  DR_FUNCTABLE,-               ;FUNCTION DECISION TABLE
             0000                  0,-                          ;CANCEL I/O ENTRY POINT
             0000                  DR_REGDUMP,-                 ;REGISTER DUMP ROUTINE
             0000                  <<RM_EC2+4+4+MBA$L_BCR+4+8>+<<5+5+1>*4>>,- ;DIAG BUFF SIZE
             0000                  <<RM_EC2+4+4+MBA$L_BCR+4+8>+<1*4>+<EMB$L_DV_REGSAV>>,- ;ERLG BUFF SI
             0000                  DR_UNIT_INIT                 ;UNIT INITIALIZATION
             0038
             0038  ;
             0038  ; DATA CHECK FUNCTION TRANSLATION TABLE
             0038  ;
             0038
             0038  CHECKTAB:                                    ;
         0A' 0038          .BYTE   CDF_WRITECHECK               ;WRITE DATA
         0A' 0039          .BYTE   CDF_WRITECHECK               ;READ DATA
         12' 003A          .BYTE   CDF_WRITECHECKH              ;WRITE HEADER AND DATA
         12' 003B          .BYTE   CDF_WRITECHECKH              ;READ HEADER AND DATA
             003C
             003C  ;
             003C  ; DRIVE TYPE DESCRIPTOR TABLE
             003C  ;
             003C  DR_DTDESC:                                   ;
        0014 003C          .WORD   ^X14                         ; RM03
          06 003E          .BYTE   DT$_RM03                     ;
          20 003F          .BYTE   32                           ; 32 SECTORS
          05 0040          .BYTE   5                            ; 5 TRACKS
        0337 0041          .WORD   823                          ; 823 CYLINDERS
    00020260 0043          .LONG   823*5*32                     ; MAXIMUM BLOCKS
    24A4D003 0047          .LONG   ^X24A4D003                   ; MEDIA IDENT "DR RM03"
    0000000F 004B  DR_DTDESCLEN=.-DR_DTDESC                     ;LENGTH OF DRIVE TYPE DESCRIPTOR
             004B
        0016 004B          .WORD   ^X16                         ; RM80
          0D 004D          .BYTE   DT$_RM80                     ;
          1F 004E          .BYTE   31                           ; 31 SECTORS
          0E 004F          .BYTE   14                           ; 14 TRACKS
        022F 0050          .WORD   559                          ; 559 CYLINDERS
    0003B3AE 0052          .LONG   559*14*31                    ; MAXIMUM BLOCKS
    24A4D050 0056          .LONG   ^X24A4D050                   ; MEDIA IDENT "DR RM80"
        0017 005A          .WORD   ^X17                         ; RM05
          0F 005C          .BYTE   DT$_RM05                     ;
          20 005D          .BYTE   32                           ; 32 SECTORS
          13 005E          .BYTE   19                           ; 19 TRACKS
        0337 005F          .WORD   823                          ; 823 CYLINDERS
    0007A2A0 0061          .LONG   823*19*32                    ; MAXIMUM BLOCKS
    24A4D005 0065          .LONG   ^X24A4D005                   ; MEDIA IDENT "DR RM05"
        0022 0069          .WORD   ^X22                         ; RP07
          07 006B          .BYTE   DT$_RP07                     ;
          32 006C          .BYTE   50                           ; 50 SECTORS
          20 006D          .BYTE   32                           ; 32 TRACKS
```

```
     0276  006E   400              .WORD   630                          ; 630 CYLINDERS
 000F6180  0070   401              .LONG   630*32*50                    ; MAXIMUM BLOCKS
 24A50007  0074   402              .LONG   ^X24A50007                   ; MEDIA IDENT "DR RP07"
           0078   403
     0000  0078   404              .WORD   0                            ; END OF TABLE
 00000089  007A   405              .BLKB   DR_DTDESCLEN                 ; SPARE DRIVE TYPE SLOT
 00000098  0089   406              .BLKB   DR_DTDESCLEN                 ; SPARE DRIVE TYPE SLOT
           0098   407
           0098   408  ;
           0098   409  ; HARDWARE I/O FUNCTION CODE TABLE
           0098   410  ;
           0098   411
           0098   412  FTAB:                                            ;
           0098   413          GENF    F_NOP                            ;NO OPERATION
           0099   414          GENF    F_NOP                            ;(NO UNLOAD FUNCTION)
           009A   415          GENF    F_SEEK                           ;SEEK CYLINDER
           009B   416          GENF    F_RECAL                          ;RECALIBRATE
           009C   417          GENF    F_DRVCLR                         ;DRIVE CLEAR
           009D   418          GENF    F_NOP                            ;(NO RELEASE PORT)
           009E   419          GENF    F_OFFSET                         ;OFFSET HEADS
           009F   420          GENF    F_RETCENTER                      ;RETURN HEADS TO CENTERLINE
           00A0   421          GENF    F_PACKACK                        ;PACK ACKNOWLEDGE
           00A1   422          GENF    F_SEARCH                         ;SEARCH FOR SECTOR
           00A2   423          GENF    F_WRITECHECK                     ;WRITE CHECK
           00A3   424          GENF    F_WRITEDATA                      ;WRITE DATA
           00A4   425          GENF    F_READDATA                       ;READ DATA
           00A5   426          GENF    F_WRITEHEAD                      ;WRITE HEADER AND DATA
           00A6   427          GENF    F_READHEAD                       ;READ HEADER AND DATA
           00A7   428          GENF    F_WRITETRACKD                    ;WRITE TRACK DESCRIPTOR
           00A8   429          GENF    F_READTRACKD                     ;READ TRACK DESCRIPTOR
           00A9   430          GENF    F_AVAILABLE                      ;AVAILABLE
           00AA   431          GENF    F_WRITECHECKH                    ;WRITE CHECK HEADER AND DATA
           00AB   432          GENF    F_READPRESET                     ;READ IN PRESET
           00AC   433          GENF    F_DIAGNOSE                       ;DIAGNOSE THE DRIVE
           00AD   434          GENF    F_SEARCHA                        ;SEARCH AHEAD OF SECTOR
           00AE   435
           00AE   436  ;
           00AE   437  ; OFFSET TABLE
           00AE   438  ;
           00AE   439
           00AE   440  OFFTAB:                                          ;
       00  00AE   441          .BYTE   0                                ;RETURN TO CENTERLINE
       01  00AF   442          .BYTE   ^X01                             ;+ OFFSET (BIT 0 = OFFSET FLAG)
       81  00B0   443          .BYTE   ^X81                             ;- OFFSET (BIT 0 = OFFSET FLAG)
       00  00B1   444          .BYTE   0                                ;RETURN TO CENTERLINE
 00000004  00B2   445  OFFSIZ=.-OFFTAB                                  ;SIZE OF OFFSET TABLE
```

```
00B2          .SBTTL  FUNCTION DECISION TABLE
00B2  ;+
00B2  ; RM03 FUNCTION DECISION TABLE
00B2  ;-
00B2
00B2  DR_FUNCTABLE:                                   ;FUNCTION DECISION TABLE
00B2          FUNCTAB ,-                              ;LEGAL FUNCTIONS
00B2                  <NOP,-                          ;NO OPERATION
00B2                  UNLOAD,-                        ;UNLOAD VOLUME
00B2                  SEEK,-                          ;SEEK CYLINDER
00B2                  RECAL,-                         ;RECALIBRATE
00B2                  DRVCLR,-                        ;DRIVE CLEAR
00B2                  RELEASE,-                       ;RELEASE PORT
00B2                  OFFSET,-                        ;OFFSET HEADS
00B2                  RETCENTER,-                     ;RETURN HEADS TO CENTERLINE
00B2                  PACKACK,-                       ;PACK ACKNOWLEDGE
00B2                  SEARCH,-                        ;SEARCH FOR SECTOR
00B2                  READPRESET,-                    ;READ IN PRESET
00B2                  SENSECHAR,-                     ;SENSE CHARACTERISTICS
00B2                  SETCHAR,-                       ;SET CHARACTERISTICS
00B2                  SENSEMODE,-                     ;SENSE MODE
00B2                  SETMODE,-                       ;SET MODE
00B2                  WRITECHECK,-                    ;WRITE CHECK
00B2                  WRITEHEAD,-                     ;WRITE HEADER AND DATA
00B2                  READHEAD,-                      ;READ HEADER AND DATA
00B2                  WRITETRACKD,-                   ;WRITE TRACK DESCRIPTOR
00B2                  READTRACKD,-                    ;READ TRACK DESCRIPTOR
00B2                  WRITECHECKH,-                   ;WRITE CHECK HEADER AND DATA
00B2                  DIAGNOSE,-                      ;DIAGNOSE THE DRIVE
00B2                  READLBLK,-                      ;READ LOGICAL BLOCK
00B2                  WRITELBLK,-                     ;WRITE LOGICAL BLOCK
00B2                  READPBLK,-                      ;READ PHYSICAL BLOCK
00B2                  WRITEPBLK,-                     ;WRITE PHYSICAL BLOCK
00B2                  READVBLK,-                      ;READ VIRTUAL BLOCK
00B2                  WRITEVBLK,-                     ;WRITE VIRTUAL BLOCK
00B2                  AVAILABLE,-                     ;AVAILABLE
00B2                  ACCESS,-                        ;ACCESS FILE AND/OR FIND DIRECTORY ENTRY
00B2                  ACPCONTROL,-                    ;ACP CONTROL FUNCTION
00B2                  CREATE,-                        ;CREATE FILE AND/OR CREATE DIRECTORY ENTRY
00B2                  DEACCESS,-                      ;DEACCESS FILE
00B2                  DELETE,-                        ;DELETE FILE AND/OR DIRECTORY ENTRY
00B2                  MODIFY,-                        ;MODIFY FILE ATTRIBUTES
00B2                  MOUNT>                          ;MOUNT VOLUME
00BA          FUNCTAB ,-                              ;BUFFERED I/O FUNCTIONS
00BA                  <NOP,-                          ;NO OPERATION
00BA                   UNLOAD,-                       ;UNLOAD VOLUME
00BA                   SEEK,-                         ;SEEK CYLINDER
00BA                   RECAL,-                        ;RECALIBRATE
00BA                   DRVCLR,-                       ;DRIVE CLEAR
00BA                   RELEASE,-                      ;RELEASE PORT
00BA                   OFFSET,-                       ;OFFSET HEADS
00BA                   RETCENTER,-                    ;RETURN HEADS TO CENTERLINE
00BA                   PACKACK,-                      ;PACK ACKNOWLEDGE
00BA                   SEARCH,-                       ;SEARCH FOR SECTOR
00BA                   READPRESET,-                   ;READ IN PRESET
00BA                   DIAGNOSE,-                     ;DIAGNOSE DRIVE
00BA                   SENSECHAR,-                    ;SENSE CHARACTERISTICS
```

```
00BA                SETCHAR,-                   ;SET CHARACTERISTICS
00BA                SENSEMODE,-                 ;SENSE MODE
00BA                SETMODE,-                   ;SET MODE
00BA                AVAILABLE,-                 ;AVAILABLE
00BA                ACCESS,-                    ;ACCESS FILE AND/OR FIND DIRECTORY ENTRY
00BA                ACPCONTROL,-                ;ACP CONTROL FUNCTION
00BA                CREATE,-                    ;CREATE FILE AND/OR CREATE DIRECTORY ENTRY
00BA                DEACCESS,-                  ;DEACCESS FILE
00BA                DELETE,-                    ;DELETE FILE AND/OR DIRECTORY ENTRY
00BA                MODIFY,-                    ;MODIFY FILE ATTRIBUTES
00BA                MOUNT>                      ;MOUNT VOLUME
00C2       FUNCTAB +ACP$READBLK,-               ;READ FUNCTIONS
00C2               <READTRACKD,-                ;READ TRACK DESCRIPTOR
00C2                READHEAD,-                  ;READ HEADER
00C2                READLBLK,-                  ;READ LOGICAL BLOCK
00C2                READPBLK,-                  ;READ PHYSICAL BLOCK
00C2                READVBLK>                   ;READ VIRTUAL BLOCK
00CE       FUNCTAB +ACP$WRITEBLK,-              ;WRITE FUNCTIONS
00CE               <WRITETRACKD,-               ;WRITE TRACK DESCRIPTOR
00CE                WRITECHECK,-                ;WRITE CHECK
00CE                WRITECHECKH,-               ;WRITE CHECK HEADER AND DATA
00CE                WRITEHEAD,-                 ;WRITE HEADER
00CE                WRITELBLK,-                 ;WRITE LOGICAL BLOCK
00CE                WRITEPBLK,-                 ;WRITE PHYSICAL BLOCK
00CE                WRITEVBLK>                  ;WRITE VIRTUAL BLOCK
00DA       FUNCTAB +ACP$ACCESS,<ACCESS,CREATE> ;ACCESS AND CREATE FILE OR DIRECTORY
00E6       FUNCTAB +ACP$DEACCESS,<DEACCESS> ;DEACCESS FILE
00F2       FUNCTAB +ACP$MODIFY,-                ;
00F2               <ACPCONTROL,-                ;ACP CONTROL FUNCTION
00F2                DELETE,-                    ;DELETE FILE OR DIRECTORY ENTRY
00F2                MODIFY>                     ;MODIFY FILE ATTRIBUTES
00FE       FUNCTAB +ACP$MOUNT,<MOUNT>           ;MOUNT VOLUME
010A       FUNCTAB +EXE$LCLDSKVALID,-           ;LOCAL DISK VALID FUNCTIONS
010A               <UNLOAD,-                    ;UNLOAD VOLUME
010A                AVAILABLE,-                 ;UNIT AVAILABLE
010A                PACKACK>                    ;PACK ACKNOWLEDGE
0116       FUNCTAB +EXE$ZEROPARM,-              ;ZERO PARAMETER FUNCTIONS
0116               <NOP,-                       ;NO OPERATION
0116                UNLOAD,-                    ;UNLOAD VOLUME
0116                RECAL,-                     ;RECALIBRATE
0116                DRVCLR,-                    ;DRIVE CLEAR
0116                RELEASE,-                   ;RELEASE PORT
0116                RETCENTER,-                 ;RETURN HEADS TO CENTERLINE
0116                READPRESET,-                ;READ IN PRESET
0116                PACKACK,-                   ;PACK ACKNOWLEDGE
0116                AVAILABLE>                  ;AVAILABLE
0122       FUNCTAB +EXE$ONEPARM,-               ;ONE PARAMETER FUNCTIONS
0122               <SEEK,-                      ;SEEK CYLINDER
0122                OFFSET,-                    ;OFFSET HEADS
0122                SEARCH,-                    ;SEARCH FOR SECTOR
0122                DIAGNOSE>                   ;DIAGNOSE THE DRIVE
012E       FUNCTAB +EXE$SENSEMODE,-             ;
012E               <SENSECHAR,-                 ;SENSE CHARACTERISTICS
012E                SENSEMODE>                  ;SENSE MODE
013A       FUNCTAB +EXE$SETCHAR,-               ;
013A               <SETCHAR,-                   ;SET CHARACTERISTICS
013A                SETMODE>                    ;SET MODE
```

```
                            0146        .SBTTL  START I/O OPERATION
                            0146  ;+
                            0146  ; DR_STARTIO - START I/O OPERATION ON DEVICE UNIT
                            0146  ;
                            0146  ; THIS ENTRY POINT IS ENTERED TO START AN I/O OPERATION ON A DEVICE UNIT.
                            0146  ;
                            0146  ; INPUTS:
                            0146  ;
                            0146  ;       R3 = ADDRESS OF I/O PACKET.
                            0146  ;       R5 = UCB ADDRESS OF DEVICE UNIT.
                            0146  ;
                            0146  ; OUTPUTS:
                            0146  ;
                            0146  ;       FUNCTION DEPENDENT PARAMETERS ARE STORED IN THE DEVICE UCB, THE ERROR
                            0146  ;       RETRY COUNT IS RESET, AND THE FUNCTION IS EXECUTED. AT FUNCTION COMPLETION
                            0146  ;       THE OPERATION IS TERMINATED THROUGH REQUEST COMPLETE.
                            0146  ;-
                            0146
                            0146  DR_STARTIO:                                         ;START I/O OPERATION
0080 C5    0081 C5    90    0146          MOVB    UCB$B_ERTMAX(R5),UCB$B_ERTCNT(R5) ;INITIALIZE ERROR RETRY COUNT
  009A C5    20 A3    B0    014D          MOVW    IRP$W_FUNC(R3),UCB$W_FUNC(R5) ;SAVE FUNCTION CODE AND MODIFIERS
           00D2 C5    B4    0153          CLRW    UCB$W_DR_MR(R5)             ;CLEAR THE MAINTENANCE VALUE
00D4 C5    FFF7 8F    AA    0157          BICW    #^C<DR_M_DUALPORT>, -       ;Clear software status and error log
                            015E                  UCB$B_DR_SSTS(R5)           ;bytes, except for dualport bit.
     50      38 A3    D0    015E          MOVL    IRP$L_MEDIA(R3),R0          ;GET PARAMETER LONGWORD
                            0162
                            0162  ;
                            0162  ; MOVE FUNCTION DEPENDENT PARAMETERS TO UCB
                            0162  ;
                            0162
        06      00    EF    0162  10$:    EXTZV   #IRP$V_FCODE,#IRP$S_FCODE,- ;EXTRACT I/O FUNCTION CODE
     51      20 A3          0165                  IRP$W_FUNC(R3),R1           ;
        51      02    91    0168          CMPB    #IO$_SEEK,R1                ;SEEK FUNCTION?
                1E    13    016B          BEQL    20$                         ;IF EQL YES
        51      06    91    016D          CMPB    #IO$_OFFSET,R1              ;OFFSET FUNCTION?
                20    13    0170          BEQL    30$                         ;IF EQL YES
        51      09    91    0172          CMPB    #IO$_SEARCH,R1              ;SEARCH FUNCTION?
                22    13    0175          BEQL    40$                         ;IF EQL YES
        51      1D    91    0177          CMPB    #IO$_DIAGNOSE,R1            ;DIAGNOSE FUNCTION?
                24    13    017A          BEQL    45$                         ;IF EQL YES
   00BC C5      50    D0    017C          MOVL    R0,UCB$W_DA(R5)             ;STORE PARAMETER LONGWORD
        51      18    91    0181          CMPB    #IO$_WRITECHECKH,R1         ;DISJOINT FUNCTION CODE?
                22    1A    0184          BGTRU   50$                         ;IF GTRU NO
        51      06    A2    0186          SUBW    #IO$_WRITECHECKH-IO$_AVAILABLE-1,R1 ;MAKE FUNCTION TABLE INDEX
                1D    11    0189          BRB     50$                         ;
                            018B
                            018B  ;
                            018B  ; SEEK FUNCTION - SET CYLINDER ADDRESS
                            018B  ;
                            018B
   00BE C5      50    B0    018B  20$:    MOVW    R0,UCB$W_DC(R5)             ;SET CYLINDER ADDRESS
                16    11    0190          BRB     50$                         ;
                            0192
                            0192  ;
                            0192  ; OFFSET FUNCTION - SET CURRENT OFFSET VALUE
                            0192  ;
                            0192
   00C8 C5    50    90  0192  30$:     MOVB    R0,UCB$W_OFFSET(R5)        ;SET OFFSET VALUE
              0F    11  0197           BRB     50$                        ;
                        0199
                        0199  ;
                        0199  ; SEARCH FUNCTION - SET SECTOR ADDRESS
                        0199  ;
                        0199
   00BC C5    50    90  0199  40$:     MOVB    R0,UCB$W_DA(R5)            ;SET SECTOR ADDRESS
              08    11  019E           BRB     50$                        ;
                        01A0
                        01A0  ;
                        01A0  ; DIAGNOSE FUNCTION - SET MAINTENANCE VALUE
                        01A0  ;
                        01A0
   00D2 C5    50    B0  01A0  45$:     MOVW    R0,UCB$W_DR_MR(R5)         ;SET MAINTENANCE VALUE
        51    03    A2  01A5           SUBW    #IO$_DIAGNOSE-IO$_READPRESET-1,R1 ;MAKE A FUNCTION TABLE INDEX
                        01A8
                        01A8  ;
                        01A8  ; FINISH PREPROCESSING
                        01A8  ;
                        01A8
   0092 C5    51    90  01A8  50$:     MOVB    R1,UCB$B_FEX(R5)           ;SAVE FUNCTION DISPATCH INDEX
     54    24 A5    D0  01AD           MOVL    UCB$L_CRB(R5),R4           ;GET ADDRESS OF CRB
     54    2C B4    D0  01B1           MOVL    @CRB$L_INTD+VEC$L_IDB(R4),R4 ;GET FIRST CONTROLLER CSR ADDRESS
  00 68 A5    00    E4  01B5           BBSC    #UCB$V_ECC,UCB$W_DEVSTS(R5),FDISPATCH ;CLEAR ECC CORRECTION MADE
                        01BA
                        01BA  ;
                        01BA  ; CENTRAL FUNCTION DISPATCH
                        01BA  ;
                        01BA
                        01BA  FDISPATCH:                                  ;FUNCTION DISPATCH
     53    58 A5    D0  01BA           MOVL    UCB$L_IRP(R5),R3           ;RETRIEVE ADDRESS OF I/O PACKET
  0D 2A A3    08    E0  01BE           BBS     #IRP$V_PHYSIO,IRP$W_STS(R3),10$ ;IF SET, PHYSICAL I/O FUNCTION
  08 64 A5    08    E0  01C3           BBS     #UCB$V_VALID,UCB$W_STS(R5),10$ ;IF SET, VOLUME SOFTWARE VALID
   50    0254 8F    3C  01C8           MOVZWL  #SS$_VOLINV,R0             ;SET VOLUME INVALID STATUS
           06D1     31  01CD           BRW     RESETXFR                   ;
                        01D0
                        01D0  ;
                        01D0  ; UNIT IS SOFTWARE VALID OR FUNCTION IS PHYSICAL I/O
                        01D0  ;
                        01D0
   50    0092 C5    9A  01D0  10$:     MOVZBL  UCB$B_FEX(R5),R0           ;GET DISPATCH FUNCTION CODE
   00C9 C5    10    90  01D5           MOVB    #RM_OF_M_FMT/256,UCB$W_OFFSET+1(R5) ;CLEAR ECI, HCI, AND SET FORMAT
   00CB C5    01    90  01DA           MOVB    #1,UCB$B_OFFRTC(R5)        ;SET INITIAL OFFSET RETRY COUNT
        00CA C5     94  01DF           CLRB    UCB$B_OFFNDX(R5)           ;CLEAR INITIAL OFFSET TABLE INDEX
                        01E3
                        01E3  ;
                        01E3  ; CHECK FOR DIAGNOSTIC MODIFIERS
                        01E3  ;
  2F 2A A3    08    E1  01E3           BBC     #IRP$V_PHYSIO,IRP$W_STS(R3),40$  ;IF CLEAR, NOT PHYSICAL I/O
06 009A C5    06    E1  01E8           BBC     #IO$V_COMMOD,UCB$W_FUNC(R5),15$  ;IF CLEAR, NO COMMAND MODIFIER
00C9 C5    80 8F    88  01EE           BISB    #RM_OF_M_CMO/256,UCB$W_OFFSET+1(R5)  ;SET COMMAND MODIFIER
                        01F4
06 009A C5    07    E1  01F4  15$:     BBC     #IO$V_MOVETRACKD,UCB$W_FUNC(R5),20$  ;IF CLR, NO MOVE TRACK DESC
00C9 C5    40 8F    88  01FA           BISB    #RM_OF_M_MTD/256,UCB$W_OFFSET+1(R5)  ;SET MOVE TRACK DESCRIPTOR
                        0200
06 009A C5    08    E1  0200  20$:     BBC     #IO$V_DIAGNOSTIC,UCB$W_FUNC(R5),30$  ;IF CLEAR, NOT DIAG MODE
```

```
   00D3 C5    80 8F     88  0206               BISB    #RM_MR_M_DM/256,UCB$W_DR_MR+1(R5)  ;SET DIAGNOSTIC MODE
                            020C
05 009A C5    09        E1  020C  30$:         BBC     #IO$V_SKPSECINH,UCB$W_FUNC(R5),40$  ;IF CLEAR, NO SSEI MODIFIER
   00C9 C5    02        88  0212               BISB    #RM_OF_M_SSEI/256,UCB$W_OFFSET+1(R5)  ;SET SKIP SECTOR ERR INH
                            0217
                            0217  ;
                            0217  ; DISPATCH TO FUNCTION HANDLING ROUTINE
                            0217  ;
                            0217  40$:
                            0217               CASE    R0,<-                         ;DISPATCH TO FUNCTION HANDLING ROUTINE
                            0217                       NOP,-                         ;NO OPERATION
                            0217                       UNLOAD,-                      ;UNLOAD VOLUME
                            0217                       SEEK,-                        ;SEEK CYLINDER
                            0217                       RECAL,-                       ;RECALIBRATE
                            0217                       DRVCLR,-                      ;DRIVE CLEAR
                            0217                       RELEASE,-                     ;RELEASE PORT
                            0217                       OFFSET,-                      ;OFFSET HEADS
                            0217                       RETCENTER,-                   ;RETURN HEADS TO CENTER
                            0217                       PACKACK,-                     ;PACK ACKNOWLEDGE
                            0217                       SEARCH,-                      ;SEARCH FOR SECTOR
                            0217                       WRITECHECK,-                  ;WRITE CHECK DATA
                            0217                       WRITEDATA,-                   ;WRITE DATA
                            0217                       READDATA,-                    ;READ DATA
                            0217                       WRITEHEAD,-                   ;WRITE HEADER AND DATA
                            0217                       READHEAD,-                    ;READ HEADER AND DATA
                            0217                       WRITETRACKD,-                 ;WRITE TRACK DESCRIPTOR
                            0217                       READTRACKD,-                  ;READ TRACK DESCRIPTOR
                            0217                       AVAILABLE,-                   ;AVAILABLE
                            0217                       WRITECHECKH,-                 ;WRITE CHECK HEADER AND DATA
                            0217                       READPRESET,-                  ;READIN PRESET
                            0217                       DIAGNOSE>                     ;DIAGNOSE DRIVE
                            0245
                            0245  ; UNLOAD or AVAILABLE - Clear UCB$V_VALID
                            0245  ;   This is the only operation which these functions need to perform.  All
                            0245  ;   devices supported by this driver do not have an unload function, and the
                            0245  ;   available function code should only clear the UCB$V_VALID bit.
                            0245
                            0245  UNLOAD:
                            0245  AVAILABLE:
64 A5      0800 8F      AA  0245               BICW    #UCB$M_VALID, UCB$W_STS(R5) ;Clear the software volume valid
                00AF    31  0248               BRW     NORMAL                      ;bit and complete function.
                            024E
                            024E  ;
                            024E  ; PACKACK - Set UCB$V_VALID and proceed with hardware pack acknowledge
                            024E  ;           function
                            024E  ;
                            024E  PACKACK:
64 A5      0800 8F      A8  024E               BISW    #UCB$M_VALID, UCB$W_STS(R5) ;Set the software volume valid
                            0254  ;            BRB     NOP                         ;bit and complete function.
                            0254
                            0254  ;
                            0254  ; NO OPERATION, SEEK, RECALIBRATE, DRIVE CLEAR, RELEASE, OFFSET,
                            0254  ; RETURN TO CENTER LINE, SEARCH, AND READ IN PRESET
                            0254  ;
                            0254
                            0254  NOP:                                             ;NO OPERATION
                            0254  SEEK:                                            ;SEEK CYLINDER
```

```
                          0254   733 RECAL:                                          ;RECALIBRATE
                          0254   734 DRVCLR:                                         ;DRIVE CLEAR
                          0254   735 RELEASE:                                        ;RELEASE PORT
                          0254   736 OFFSET:                                         ;OFFSET READ HEADS
                          0254   737 RETCENTER:                                      ;RETURN TO CENTERLINE
                          0254   738 SEARCH:                                         ;SEARCH FOR SECTOR
                          0254   739 READPRESET:                                     ;READIN PRESET
                          0254   740         EXFUNC  RETRY                           ;EXECUTE HOUSEKEEPING FUNCTION
           00A1      31   0259   741         BRW     NORMAL                          ;
                          025C   742
                          025C   743 ;
                          025C   744 ; WRITE TRACK DESCRIPTOR and READ TRACK DESCRIPTOR
                          025C   745 ;       Both want to SEEK rather than to SEARCH to arrive on cylinder.
                          025C   746 ;
                          025C   747
                          025C   748 WRITETRACKD:                                    ;WRITE TRACK DESCRIPTOR
      00D4 C5    04      88   025C   749         BISB    #DR_M_NOECC, UCB$B_DR_SSTS(R5) ; Signal don't correct with ECC.
                          0261   750
                          0261   751 READTRACKD:                                     ;READ TRACK DESCRIPTOR
              0C      E0  0261   752         BBS     #IO$V_INHSEEK,-
        23 009A C5        0263   753                 UCB$W_FUNC(R5),TRANRQCH ; If set, NO explicit SEEK
                          0267   754         EXFUNC  RETRY,F_SEEK                    ; Seek to cylinder
              19      11  026F   755         BRB     TRANRQCH                        ;  and branch around to common code.
                          0271   756
                          0271   757 ;
                          0271   758 ; WRITE CHECK DATA AND WRITE CHECK HEADER AND DATA
                          0271   759 ;
                          0271   760
                          0271   761 WRITECHECK:                                     ;WRITE CHECK DATA
                          0271   762 WRITECHECKH:                                    ;WRITE CHECK HEADER AND DATA
   00 009A C5    0E      E4   0271   763         BBSC    #IO$V_DATACHECK,UCB$W_FUNC(R5),WRITEDATA ;CLEAR DATA CHECK REQUEST
                          0277   764
                          0277   765 ;
                          0277   766 ; WRITE DATA, WRITE HEADER AND DATA,
                          0277   767 ; WRITE CHECK DATA, AND WRITE CHECK HEADER AND DATA
                          0277   768 ;
                          0277   769
                          0277   770 WRITEDATA:                                      ;WRITE DATA
                          0277   771 WRITEHEAD:                                      ;WRITE HEADER AND DATA
      00D4 C5    04      88   0277   772         BISB    #DR_M_NOECC, UCB$B_DR_SSTS(R5) ; Signal don't correct with ECC.
                          027C   773
                          027C   774 ;
                          027C   775 ; READ DATA, READ HEADER AND DATA,
                          027C   776 ; WRITE DATA, WRITE HEADER AND DATA,
                          027C   777 ; WRITE CHECK DATA, AND WRITE CHECK HEADER AND DATA
                          027C   778 ;
                          027C   779
                          027C   780 READDATA:                                       ;READ DATA
                          027C   781 READHEAD:                                       ;READ HEADER AND DATA
   08 009A C5    0C      E0   027C   782         BBS     #IO$V_INHSEEK,UCB$W_FUNC(R5),TRANRQCH ;IF SET, NO EXPLICIT SEEK
                          0282   783         EXFUNC  RETRY,F_SEARCHA                 ;SEARCH AHEAD OF STARTING SECTOR
                          028A   784
                          028A   785 ;
                          028A   786 ; DATA TRANSFER OR DIAGNOSE - REQUEST CHANNEL
                          028A   787 ;
                          028A   788
                          028A   789 DIAGNOSE:                                       ;DIAGNOSE
```

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                             028A    790 TRANRQCH:                                       ;DATA TRANSFER
                             028A    791         REQPCHAN LOW                            ;REQUEST PRIMARY CHANNEL
                             0290    792
                             0290    793 ;
                             0290    794 ; DATA TRANSFER - CHANNEL ALREADY OWNED
                             0290    795 ;
                             0290    796
                             0290    797 TRANNOCH:                                       ;DATA TRANSFER CHANNEL OWNED
      50   0092 C5      9A   0290    798         MOVZBL  UCB$B_FEX(R5),R0                ;GET FUNCTION DISPATCH INDEX
                             0295    799         EXFUNC  TRANXT                          ;EXECUTE TRANSFER FUNCTION
                             029A    800
                             029A    801 ;
                             029A    802 ; DATA CHECK
                             029A    803 ;
                             029A    804
                             029A    805 DATACHECK:                                      ;DATA CHECK
   5D 009A C5   0E      E1   029A    806         BBC     #IO$V_DATACHECK,UCB$W_FUNC(R5),NORMAL ;IF CLR, NO DATA CHECK
     50   0639 8F       3C   02A0    807         MOVZWL  #SS$_BADECC,R0                  ;ASSUME ECC CORRECTION WAS MADE
    56 68 A5    00      E0   02A5    808         BBS     #UCB$V_ECC,UCB$W_DEVSTS(R5),CHECKXT ;IF SET, ECC CORRECTION MADE
                             02AA    809         RELCHAN                                 ;RELEASE CHANNEL
     00D4 C5    01      88   02B0    810         BISB    #DR_M_DCK,UCB$B_DR_SSTS(R5)     ;SET DATA CHECK IN PROGRESS
     00C9 C5    10      90   02B5    811         MOVB    #RM_OF_M_FMT/256,UCB$W_OFFSET+1(R5) ;CLEAR ECI, HCI, AND SET FORMAT
     00D4 C5    04      88   02BA    812         BISB    #DR_M_NOECC, UCB$B_DR_SSTS(R5) ; Signal don't correct with ECC.
     00CB C5    01      90   02BF    813         MOVB    #1,UCB$B_OFFRTC(R5)             ;SET INITIAL OFFSET RETRY COUNT
          00CA C5       94   02C4    814         CLRB    UCB$B_OFFNDX(R5)                ;CLEAR INITIAL OFFSET TABLE INDEX
       52    58 A5      D0   02C8    815         MOVL    UCB$L_IRP(R5),R2                ;GET ADDRESS OF IRP
    78 A5    2C A2      7D   02CC    816         MOVQ    IRP$L_SVAPTE(R2),UCB$L_SVAPTE(R5) ;RESET TRANSFER PARAMETERS
  00BC C5    38 A2      D0   02D1    817         MOVL    IRP$L_MEDIA(R2),UCB$W_DA(R5)   ;
    0B 2A A2    08      E1   02D7    818         BBC     #IRP$V_PHYSIO,IRP$W_STS(R2),CHECKRETRY  ;IF CLEAR NOT PHYS I/O
   05 009A C5   09      E1   02DC    819         BBC     #IO$V_SKPSECINH,UCB$W_FUNC(R5),CHECKRETRY  ;IF CLEAR NO SSEI MOD
     00C9 C5    02      88   02E2    820         BISB    #RM_OF_M_SSEI/256,UCB$W_OFFSET+1(R5)  ;SET SKIP SECTOR ERR INH
                             02E7    821
                             02E7    822 ;
                             02E7    823 ; DATA CHECK RETRY
                             02E7    824 ;
                             02E7    825
                             02E7    826 CHECKRETRY:                                     ;DATA CHECK RETRY
                             02E7    827         REQPCHAN LOW                            ;REQUEST PRIMARY CHANNEL FOR DATA CHECK
      50   0092 C5      9A   02ED    828         MOVZBL  UCB$B_FEX(R5),R0                ;GET FUNCTION DISPATCH INDEX
     50   FD36 CF40     9A   02F2    829         MOVZBL  CHECKTAB-CDF_WRITEDATA[R0],R0 ;GET CASE TABLE INDEX
                             02F8    830         EXFUNC  TRANXT                          ;EXECUTE DATA CHECK FUNCTION
                             02FD    831
                             02FD    832 ;
                             02FD    833 ; SUCCESSFUL OPERATION COMPLETION
                             02FD    834 ;
                             02FD    835
                             02FD    836 NORMAL:                                         ;
           50    01     3C   02FD    837         MOVZWL  #SS$_NORMAL,R0                  ;SET NORMAL COMPLETION STATUS
                             0300    838 CHECKXT:                                        ;
               0208     31   0300    839         BRW     FUNCXT                          ;
                             0303    840
                             0303    841 ;
                             0303    842 ; TRANSFER ENDED WITH A RETRIABLE ERROR
                             0303    843 ;
                             0303    844
                             0303    845 TRANXT:                                         ;TRANSFER EXIT
     0093 C5    08      91   0303    846         CMPB    #CDF_WRITEDATA,UCB$B_CEX(R5) ;WRITE DATA FUNCTION?
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                        24    13  0308                 BEQL    RETRY                       ;IF EQL YES
          0093 C5       0D    91  030A                 CMPB    #CDF_WRITEHEAD,UCB$B_CEX(R5) ;WRITE HEADER FUNCTION?
                        1D    13  030F                 BEQL    RETRY                       ;IF EQL YES
     51   00064F74 8F         D3  0311                 BITL    #MBA$M_SR_DLT!-             ;DATA LATE OR,
                                  0318                         MBA$M_SR_INVMAP!-           ;INVALID MAP REGISTER OR,
                                  0318                         MBA$M_SR_MAPPE!-            ;MAP REGISTER PARITY ERROR OR,
                                  0318                         MBA$M_SR_MCPE!-             ;MASSBUS CONTROL PARITY ERROR OR,
                                  0318                         MBA$M_SR_SPE!-              ;MBA SILO PARITY ERROR OR,
                                  0318                         MBA$M_SR_MDPE!-             ;MASSBUS DATA PARITY ERROR OR,
                                  0318                         MBA$M_SR_MXF!-              ;MISSED TRANSFER OR,
                                  0318                         MBA$M_SR_NED!-              ;NONEXISTENT DISK OR,
                                  0318                         MBA$M_SR_RDS!-              ;READ DATA SUBSTITUTE OR,
                                  0318                         MBA$M_SR_WCKLWR!-           ;WRITE CHECK LOWER BYTE OR,
                                  0318                         MBA$M_SR_WCKUPR,R1          ;WRITE CHECK UPPER BYTE?
                        14    12  0318                 BNEQ    RETRY                       ;IF NEQ YES - RETRY FUNCTION
        00D0 C5    1C88 8F    B3  031A                 BITW    #RM_ER2_M_DPE!-             ;DATA PARITY ERROR OR,
                                  0321                         RM_ER2_M_DVC!-              ;DEVICE CHECK OR,
                                  0321                         RM_ER2_M_LBC!-              ;LOSS OF BIT CLOCK OR,
                                  0321                         RM_ER2_M_LSC!-              ;LOSS OF SYSTEM CLOCK OR,
                                  0321                         RM_ER2_M_IVC,UCB$W_DR_ER2(R5) ;INVALID COMMAND?
                        0B    12  0321                 BNEQ    RETRY                       ;IF NEQ YES - RETRY FUNCTION
              0A 52     08    E0  0323                 BBS     #RM_ER1_V_HCRC,R2,ECC       ;Test HCRC before HCE.
             52    20A8 8F    B3  0327                 BITW    #RM_ER1_M_OPI!-             ;OPERATION INCOMPLETE OR,
                                  032C                         RM_ER1_M_PAR!-              ;PARITY ERROR OR,
                                  032C                         RM_ER1_M_HCE!-              ;HEADER COMPARE ERROR OR,
                                  032C                         RM_ER1_M_WCF,R2             ;WRITE CLOCK FAIL?
                        03    13  032C                 BEQL    ECC                         ;IF EQL NO
                                  032E        RETRY:                                       ;
                      0110    31  032E                 BRW     RETRYERR                    ;RETRIABLE ERROR
                                  0331
                                  0331        ;
                                  0331        ; ECC, DRIVE TIMING, OR HEADER ERROR - APPLY ECC OR PERFORM OFFSET RECOVERY
                                  0331        ;
                                  0331
                                  0331        ECC:                                         ;ECC CORRECTION
   51    7E A5    00D8 C5     A1  0331                 ADDW3   UCB$L_DR_BCR(R5), -         ; Compute bytes transfered then
                                  0338                         UCB$W_BCNT(R5), R1          ; clear byte offset bits and
  50   51     FFFF01FF 8F     CB  0338                 BICL3   #^XFFFF01FF, R1, R0         ; convert result to a longword.
                        77    13  0340                 BEQL    OFF                         ; Branch if whole blocks xfered is zero.
             51    01FF 8F    B3  0342                 BITW    #^X1FF, R1                  ; Was a partial block transfered?
                        70    12  0347                 BNEQ    OFF                         ; Branch if partial block transfered.
              10 52     08    E1  0349                 BBC     #RM_ER1_V_HCRC, R2, 10$     ; Branch if error was not HCRC.
                        07    91  034D                 CMPB    #DT$_RP07,-                 ; Is this drive an RP07?
                     41 A5        034F                         UCB$B_DEVTYPE(R5)           ;
                        11    12  0351                 BNEQ    20$                         ; Branch if not.
              00000400 8F     E1  0353                 BBC     #RM_OF_M_HCI,-              ; Branch if header compare inhibit
                07 00C8 C5        0359                         UCB$W_OFFSET(R5),20$        ;  isn't set.
    50        00000200 8F     C2  035D        10$:     SUBL2   #512, R0                    ; Else, reduce bytes xfered by a block.
             52    1140 8F    B3  0364        20$:     BITW    #RM_ER1_M_DTE!-             ; For:  DRIVE TIMING ERROR
                                  0369                         RM_ER1_M_ECH!-              ;       ECC HARD ERROR
                                  0369                         RM_ER1_M_HCRC,R2            ;       HEADER CRC ERROR
                        4E    12  0369                 BNEQ    OFF                         ;           perform offset recovery.
          48 00D4 C5    02    E0  036B                 BBS     #DR_V_NOECC, -              ;If it won't help, skip ECC correction.
                                  0371                         UCB$B_DR_SSTS(R5), OFF      ;
                  7E    52    7D  0371                 MOVQ    R2,-(SP)                    ; Save work registers.
  52    00C6 C5   0B    00    EA  0374                 FFS     #0,#11,UCB$W_EC2(R5),R2     ; Find the first error bit in the ECC
                                  037B                                                     ;  pattern.
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            53    0A   52   C3  037B              SUBL3   R2,#10,R3                 ; Get the number of error bits
                                037F                                                ;  remaining in the pattern.
                       09   15  037F              BLEQ    30$                       ; Branch if no other bits in pattern.
                       52   D6  0381              INCL    R2                        ; Point to next bit in pattern.
   52  00C6 C5    53   52   EF  0383              EXTZV   R2,R3,UCB$W_EC2(R5),R2    ; Is there more than one error bit set?
                       0C   BA  038A   30$:       POPR    #^M<R3,R2>                ; Restore work registers without
                                038C                                                ;  affecting flags.
                       26   1A  038C              BGTRU   DEFER_ECC                 ; If more than one error bit set, don't
                                038E                                                ;  apply ECC correction.
                                038E   ;
                                038E   ; APPLY_ECC -
                                038E   ;
                                038E   ; Apply ECC correction to correct a single bit error.
                                038E   ;
                                038E
                                038E   APPLY_ECC:
                 7E    51   3C  038E              MOVZWL  R1,-(SP)                  ; Save total bytes transfered, inc. ECC.
          00000000'GF       16  0391              JSB     G^IOC$APPLYECC            ; Apply ECC correction.
                       50 BED0  0397              POPL    R0                        ; Retrieve transfered byte count.
          00000000'GF       16  039A              JSB     G^IOC$UPDATRANSP          ; Update transfer parameters.
                  00CA C5   94  03A0              CLRB    UCB$B_OFFNDX(R5)          ; Reset offset table index.
                       02   8A  03A4              BICB    #DR_M_OM,-                ; Clear offset mode.
                  00D4 C5       03A6                      UCB$B_DR_SSTS(R5)         ;
                    7E A5   B5  03A9              TSTW    UCB$W_BCNT(R5)            ; Any more to transfer?
                       03   13  03AC              BEQL    20$                       ; If EQL no.
                     FEDF   31  03AE              BRW     TRANNOCH                  ; Transfer next segment.
                     FEE6   31  03B1   20$:       BRW     DATACHECK                 ; Check for write check.
                                03B4
                                03B4   ;
                                03B4   ; DEFER_ECC -
                                03B4   ;
                                03B4   ; Don't apply ECC correction for multiple bit errors unless the error cannot
                                03B4   ; be recovered with offset retries.
                                03B4   ;
                                03B4
                                03B4   DEFER_ECC:
                       10   88  03B4              BISB    #DR_M_ECC_DEFER,-         ; Set flag to indicate that ECC
                  00D4 C5       03B6                      UCB$B_DR_SSTS(R5)         ;  can be used if offset recovery fails.
                                03B9
                                03B9   ;
                                03B9   ; OFF - OFFSET RECOVERY
                                03B9   ;
                                03B9   ; THIS CODE IS EXECUTED WHEN A DRIVE TIMING ERROR, HEADER CRC, OR ECC
                                03B9   ; HARD ERROR IS DETECTED ON A READ FUNCTION.
                                03B9   ;
                                03B9
                                03B9   OFF:                                         ;OFFSET RECOVERY
                       50   D5  03B9              TSTL    R0                        ;ANY GOOD DATA TRANSFERED?
                       33   13  03BB              BEQL    30$                       ;IF EQL NO
                                03BD
                                03BD   ;
                                03BD   ; THE TRANSFER ENDED IN AN ERROR BUT THERE WERE SECTORS TRANSFERED THAT
                                03BD   ; CONTAINED GOOD DATA. SINCE THE ERROR COULD HAVE BEEN CAUSED BY A CYLIN-
                                03BD   ; DER CROSSING, THE GOOD DATA IS SAVED AND THE TRANSFER IS RETRIED FROM THE
                                03BD   ; POINT OF ERROR.
                                03BD   ;
                                03BD
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           00000000'GF    16  03BD     961            JSB     G^IOC$UPDATRANSP            ;UPDATE TRANSFER PARAMETERS
                 7E A5    B5  03C3     962            TSTW    UCB$W_BCNT(R5)              ; Any more data to transfer?
                    03    12  03C6     963            BNEQ    5$                          ; Branch if so.
                  FECF    31  03C8     964            BRW     DATACHECK                   ; Otherwise, go check for write check.
               00CA C5    94  03CB     965 5$:        CLRB    UCB$B_OFFNDX(R5)            ;RESET OFFSET TABLE INDEX
          00CB C5   10    90  03CF     966 10$:       MOVB    #16,UCB$B_OFFRTC(R5)        ;SET OFFSET RETRY COUNT
          00CA C5   04    91  03D4     967            CMPB    #OFFSIZ,UCB$B_OFFNDX(R5) ;ALL OFFSETS TRIED?
                    08    12  03D9     968            BNEQ    20$                         ; Branch if not.
                    04    E4  03DB     969            BBSC    #DR_V_ECC_DEFER,-           ; Correct the error with ECC if we can.
               00D4 C5        03DD     970                    UCB$B_DR_SSTS(R5),-         ;
                    AD        03E0     971                    APPLY_ECC                   ;
                    53    11  03E1     972            BRB     90$                         ; Otherwise, fatal error.
                              03E3     973 20$:       RELCHAN                             ;RELEASE CHANNEL
          00D4 C5   02    8A  03E9     974            BICB    #DR_M_OM,UCB$B_DR_SSTS(R5)  ;CLEAR OFFSET MODE
                    35    11  03EE     975            BRB     60$                         ;
                              03F0     976
                              03F0     977 ;
                              03F0     978 ; NO GOOD DATA TRANSFERED - CHECK IF CHANGE IN OFFSET NEEDED
                              03F0     979 ;
                              03F0     980
     52    9040 8F        B3  03F0     981 30$:       BITW    #RM_ER1_M_DCK!-             ;DATA CHECK OR,
                              03F5     982                    RM_ER1_M_DTE!-              ;DRIVE TIMING OR,
                              03F5     983                    RM_ER1_M_ECH,R2             ;ECC HARD ERROR?
                    05    12  03F5     984            BNEQ    40$                         ;IF NEQ YES
          00C9 C5   04    88  03F7     985            BISB    #RM_OF_M_HCI/256,UCB$W_OFFSET+1(R5) ;SET HEADER COMPARE INHIBIT
               00CB C5    97  03FC     986 40$:       DECB    UCB$B_OFFRTC(R5)            ;CHANGE CURRENT OFFSET?
                    28    12  0400     987            BNEQ    70$                         ;IF NEQ NO
               00CA C5    96  0402     988            INCB    UCB$B_OFFNDX(R5)            ;UPDATE OFFSET TABLE INDEX
     50        00CA C5    9A  0406     989            MOVZBL  UCB$B_OFFNDX(R5),R0         ;GET NEXT OFFSET TABLE INDEX
00CB C5    FC9D CF40      90  040B     990            MOVB    OFFTAB-1[R0],UCB$W_OFFSET(R5) ;GET NEXT OFFSET VALUE
                    BA    13  0413     991            BEQL    10$                         ;IF EQL RETURN TO CENTERLINE
          00CB C5   02    90  0415     992            MOVB    #2,UCB$B_OFFRTC(R5)         ;SET OFFSET RETRY COUNT
                              041A     993            RELCHAN                             ;RELEASE CHANNEL
          00D4 C5   02    88  0420     994            BISB    #DR_M_OM,UCB$B_DR_SSTS(R5)  ;SET OFFSET MODE
          00C9 C5   04    8A  0425     995 60$:       BICB    #RM_OF_M_HCI/256,UCB$W_OFFSET+1(R5) ;CLEAR HEADER COMPARE INHIBIT
       03 00D4 C5   00    E0  042A     996 70$:       BBS     #DR_V_DCK,UCB$B_DR_SSTS(R5),80$ ;IF SET, DATA CHECK FUNCTION
                  FE57    31  0430     997            BRW     TRANRQCH                    ;TRY FUNCTION AGAIN
                  FEB1    31  0433     998 80$:       BRW     CHECKRETRY                  ;TRY DATA CHECK AGAIN
                              0436     999
       50       04 A3     D0  0436    1000 90$:       MOVL    RM_DS(R3),R0                ;GET DRIVE STATUS
     51        00CC C5    D0  043A    1001            MOVL    UCB$L_DR_SR(R5),R1          ;GET MBA STATUS
                    32    11  043F    1002            BRB     FATALERR                    ;
                              0441    1003
                              0441    1004 ;
                              0441    1005 ; RETRIABLE ERROR
                              0441    1006 ;
                              0441    1007
                              0441    1008 RETRYERR:                                  ;RETRIABLE ERROR
                    07    BB  0441    1009            PUSHR   #^M<R0,R1,R2>               ; Save error status registers.
                              0443    1010            RELCHAN                             ; Release channel before possible RECAL
                    07    BA  0449    1011            POPR    #^M<R0,R1,R2>               ; Restore error status registers.
       04 00D0 C5   0E    E0  044B    1012            BBS     #RM_ER2_V_SKI,UCB$W_DR_ER2(R5),10$ ;IF SET, SEEK INCOMPLETE
            0D 52   07    E1  0451    1013            BBC     #RM_ER1_V_HCE,R2,20$        ;IF CLR, HEADER COMPARED
                              0455    1014 10$:       EXFUNC  FATALERR,F_RECAL            ;RECALIBRATE HEADS
     52    2000 8F        3C  045D    1015            MOVZWL  #RM_ER1_M_OPI,R2            ;SET AN ERROR FOR CALLER TO SEE
               0080 C5    97  0462    1016 20$:       DECB    UCB$B_ERTCNT(R5)            ;ANY RETRIES LEFT?
                    0B    13  0466    1017            BEQL    FATALERR                    ;IF EQL NO
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                        0468  1018            EXFUNC  FATALERR,F_DRVCLR          ; Issue drive clear before retrying.
           FD47   31    0470  1019            BRW     FDISPATCH                  ;
                        0473  1020
                        0473  1021  ;
                        0473  1022  ; FATAL CONTROLLER/DRIVE ERROR, ERROR RETRY COUNT EXHAUSTED, ERROR RETRY
                        0473  1023  ; INHIBITED, OR FINAL OFFSET TRIED
                        0473  1024  ;
                        0473  1025
                        0473  1026  FATALERR:                                  ;FATAL ERROR - SET STATUS
      08 50   0C  E0    0473  1027            BBS     #RM_DS_V_MOL,R0,10$        ; Branch if not offline.
    50   01A4 8F  3C    0477  1028            MOVZWL  #SS$_MEDOFL,R0             ; Otherwise, set medium offline status
            008C  31    047C  1029            BRW     FUNCXT                     ;   and branch to common completion exit.
      08 50   06  E0    047F  1030  10$:      BBS     #RM_DS_V_VV,R0,20$         ; Branch if not volume invalid.
    50   0254 8F  3C    0483  1031            MOVZWL  #SS$_VOLINV,R0             ; Otherwise, set volume invalid status.
            0080  31    0488  1032            BRW     FUNCXT                     ;   and branch to common completion exit.
      08 52   0E  E1    048B  1033  20$:      BBC     #RM_ER1_V_UNS,R2,30$       ; Branch if not drive unsafe.
    50   023C 8F  3C    048F  1034            MOVZWL  #SS$_UNSAFE,R0             ; Otherwise, set drive unsafe status.
            0074  31    0494  1035            BRW     FUNCXT                     ;   and branch to common completion exit.
    50   02D4 8F  3C    0497  1036  30$:      MOVZWL  #SS$_OPINCOMPL,R0          ;SET OPERATION INCOMPLETE STATUS
      6B 52   0D  E0    049C  1037            BBS     #RM_ER1_V_OPI,R2,FUNCXT    ;IF SET, OPERATION INCOMPLETE
    50   025C 8F  3C    04A0  1038            MOVZWL  #SS$_WRITLCK,R0            ;SET WRITE LOCK ERROR STATUS
      62 52   0B  E0    04A5  1039            BBS     #RM_ER1_V_WLE,R2,FUNCXT    ;IF SET, WRITE LOCK ERROR
    50   0134 8F  3C    04A9  1040            MOVZWL  #SS$_IVADDR,R0             ;SET INVALID DISK ADDRESS STATUS
    52   0600 8F  B3    04AE  1041            BITW    #RM_ER1_M_AOE!-            ;DISK ADDRESS OVERFLOW OR,
                        04B3  1042                    RM_ER1_M_IAE,R2            ;INVALID DISK ADDRESS ERROR?
              56  12    04B3  1043            BNEQ    FUNCXT                     ;IF NEQ YES
    50   008C 8F  3C    04B5  1044            MOVZWL  #SS$_DRVERR,R0             ;SET DRIVE ERROR STATUS
    52   1027 8F  B3    04BA  1045            BITW    #RM_ER1_M_DTE!-            ;DRIVE TIMING ERROR OR,
                        04BF  1046                    RM_ER1_M_ILF!-             ;ILLEGAL FUNCTION OR,
                        04BF  1047                    RM_ER1_M_ILR!-             ;ILLEGAL REGISTER OR,
                        04BF  1048                    RM_ER1_M_RMR!-             ;REGISTER MODIFY REFUSE OR,
                        04BF  1049                    RM_ER1_M_WCF,R2            ;WRITE CLOCK FAIL ERROR?
              4A  12    04BF  1050            BNEQ    FUNCXT                     ;IF NEQ YES
    50   01F4 8F  3C    04C1  1051            MOVZWL  #SS$_PARITY,R0             ; Set parity error status.
    52   8140 8F  B3    04C6  1052            BITW    #RM_ER1_M_DCK!-            ; Data check error or,
                        04CB  1053                    RM_ER1_M_ECH!-             ;   ECC hard error or,
                        04CB  1054                    RM_ER1_M_HCRC,R2           ;   header CRC error?
              3E  12    04CB  1055            BNEQ    FUNCXT                     ; Branch if so.
  38 00D0 C5  0F  E0    04CD  1056            BBS     #RM_ER2_V_BSE,UCB$W_DR_ER2(R5),FUNCXT ;IF SET, BAD SECTOR ERROR
    50   0054 8F  3C    04D3  1057            MOVZWL  #SS$_CTRLERR,R0            ; Set fatal controller error status.
    52   0088 8F  B3    04D8  1058            BITW    #RM_ER1_M_HCE!-            ; Header compare error or,
                        04DD  1059                    RM_ER1_M_PAR,R2            ;   parity error?
              2C  12    04DD  1060            BNEQ    FUNCXT                     ; Branch if so.
 51   00024064 8F  D3   04DF  1061            BITL    #MBA$M_SR_MAPPE!-          ;MAP PARITY ERROR OR,
                        04E6  1062                    MBA$M_SR_MCPE!-            ;MASSBUS CONTROL PARITY ERROR OR,
                        04E6  1063                    MBA$M_SR_SPE!-             ;MBA SILO PARITY ERROR OR,
                        04E6  1064                    MBA$M_SR_MDPE!-            ;MASSBUS DATA PARITY ERROR OR,
                        04E6  1065                    MBA$M_SR_RDS,R1            ;READ DATA SUBSTITUTE?
              23  12    04E6  1066            BNEQ    FUNCXT                     ;IF NEQ YES
    50   00BC 8F  3C    04E8  1067            MOVZWL  #SS$_FORMAT,R0             ;SET FORMAT ERROR STATUS
      1A 52   04  E0    04ED  1068            BBS     #RM_ER1_V_FER,R2,FUNCXT    ;IF SET, FORMAT ERROR
    50   005C 8F  3C    04F1  1069            MOVZWL  #SS$_DATACHECK,R0          ;SET DATA CHECK ERROR STATUS
    51   0600 8F  B3    04F6  1070            BITW    #MBA$M_SR_WCKLWR!-         ;WRITE CHECK ERROR LOWER BYTE OR,
                        04FB  1071                    MBA$M_SR_OCKUPR,R1         ;WRITE CHECK ERROR UPPER BYTE?
              0E  12    04FB  1072            BNEQ    FUNCXT                     ;IF NEQ YES
    50   01C4 8F  3C    04FD  1073            MOVZWL  #SS$_NONEXDRV,R0           ;SET NONEXISTENT DRIVE STATUS
      05 51   12  E0    0502  1074            BBS     #MBA$V_SR_NED,R1,FUNCXT    ;IF SET, NONEXISTENT DRIVE
      50   0054 8F    3C 0506          MOVZWL  #SS$_CTRLERR,R0            ;SET CONTROLLER ERROR STATUS
                         050B
                         050B    ;
                         050B    ; FUNCTION COMPLETION COMMON EXIT
                         050B    ;
                         050B
                         050B    FUNCXT:                                  ;FUNCTION EXIT
                  50  DD 050B          PUSHL   R0                         ;SAVE FINAL REQUEST STATUS
       00000000'GF    16 050D          JSB     G^IOC$DIAGBUFILL           ;FILL DIAGNOSTIC BUFFER IF PRESENT
                         0513          RELCHAN                            ;RELEASE CHANNEL IF OWNED
     0092 C5      0A  91 0519          CMPB    #CDF_WRITECHECK,UCB$B_FEX(R5) ;DRIVE RELATED FUNCTION?
                  1A  1A 051E          BGTRU   10$                        ;IF GTRU YES
     0092 C5      13  91 0520          CMPB    #CDF_READPRESET,UCB$B_FEX(R5) ;DRIVE RELATED FUNCTION?
                  13  1B 0525          BLEQU   10$                        ;IF LEQU YES
     0092 C5      11  91 0527          CMPB    #CDF_AVAILABLE,UCB$B_FEX(R5) ;DRIVE RELATED FUNCTION?
                  0C  13 052C          BEQL    10$                        ;IF EQL YES
      52      58 A5   D0 052E          MOVL    UCB$L_IRP(R5),R2           ;RETRIEVE ADDRESS OF IRP
            00D8 C5   A1 0532          ADDW3   UCB$L_DR_BCR(R5),-
   02 AE      32 A2      0536                  IRP$W_BCNT(R2),2(SP)       ; Calculate bytes transfered
                  51  D4 053A    10$:  CLRL    R1                         ;CLEAR SECOND STATUS LONGWORD
                  50 8ED0 053C         POPL    R0                         ;RETRIEVE FINAL REQUEST STATUS
     53    0091 C5    9A 053F          MOVZBL  UCB$B_SLAVE+1(R5),R3       ;GET DRIVE OFFSET CONSTANT
   53   0400 C443     DE 0544          MOVAL   MBA$L_ERB(R4)[R3],R3       ;GET ADDRESS OF DRIVE REGISTERS
            63    09  9A 054A          MOVZBL  #F_DRVCLR!1,RM_CS1(R3)     ; Issue a drive clear before release.
            63    0B  9A 054D          MOVZBL  #F_RELEASE!1,RM_CS1(R3)    ;RELEASE PORT
                         0550          REQCOM                             ;COMPLETE REQUEST
```

```
0556           .SBTTL  HARDWARE FUNCTION EXECUTION
0556   ;
0556   ; FEX - HARDWARE FUNCTION EXECUTION
0556   ;
0556   ; THIS ROUTINE IS CALLED VIA A BSB WITH A BYTE IMMEDIATELY FOLLOWING THAT
0556   ; SPECIFIES THE ADDRESS OF AN ERROR ROUTINE. ALL DATA IS ASSUMED TO HAVE BEEN
0556   ; SET UP IN THE UCB BEFORE THE CALL. THE APPROPRIATE PARAMETERS ARE LOADED
0556   ; INTO DEVICE REGISTERS AND THE FUNCTION IS INITIATED. IF THE FUNCTION IS AN
0556   ; IMMEDIATE FUNCTION CONTROL RETURNS IMMEDIATELY. ELSE THE RETURN ADDRESS
0556   ; IS STORED IN THE UCB AND A WAITFOR INTERRUPT IS EXECUTED. WHEN THE INTER-
0556   ; RUPT OCCURS, CONTROL IS RETURNED TO THE CALLER.
0556   ;
0556   ; INPUTS:
0556   ;
0556   ;       R0 = FUNCTION TABLE DISPATCH INDEX.
0556   ;       R3 = ADDRESS OF DRIVE CONTROL STATUS REGISTER 1.
0556   ;       R4 = ADDRESS OF MBA CONFIGURATION STATUS REGISTER.
0556   ;       R5 = DEVICE UNIT UCB ADDRESS.
0556   ;
0556   ;       00(SP) = RETURN ADDRESS OF CALLER.
0556   ;       04(SP) = RETURN ADDRESS OF CALLER'S CALLER.
0556   ;
0556   ;       IMMEDIATELY FOLLOWING INLINE AT THE CALL SITE IS A BYTE WHICH CONTAINS
0556   ;       A BRANCH DESTINATION TO AN ERROR RETRY ROUTINE.
0556   ;
0556   ; OUTPUTS:
0556   ;
0556   ;       THERE ARE FOUR EXITS FROM THIS ROUTINE:
0556   ;
0556   ;       1. SPECIAL CONDITION - THIS EXIT IS TAKEN IF A POWER FAILURE OCCURS
0556   ;               OR THE OPERATION TIMES OUT. IT IS A JUMP TO THE APPROPRIATE
0556   ;               ERROR ROUTINE.
0556   ;
0556   ;       2. FATAL ERROR - THIS EXIT IS TAKEN IF A FATAL CONTROLLER OR DRIVE
0556   ;               ERROR OCCURS OR IF ANY ERROR OCCURS AND ERROR RETRY IS
0556   ;               INHIBITED. IT IS A JUMP TO THE FATAL ERROR EXIT ROUTINE.
0556   ;
0556   ;       3. RETRIABLE ERROR - THIS EXIT IS TAKEN IF A RETRIABLE CONTROLLER
0556   ;               OR DRIVE ERROR OCCURS AND ERROR RETRY IS NOT INHIBITED.
0556   ;               IT CONSISTS OF TAKING THE ERROR BRANCH EXIT.
0556   ;
0556   ;       4. SUCCESSFUL OPERATION - THIS EXIT IS TAKEN IF NO ERROR OCCURS
0556   ;               DURING THE OPERATION. IT CONSISTS OF A RETURN INLINE.
0556   ;
0556   ;       IN ALL CASES IF AN ERROR OCCURS, AN ATTEMPT IS MADE TO LOG THE ERROR.
0556   ;
0556   ;       IN ALL CASES FINAL DRIVE AND CONTROLLER REGISTERS ARE RETURNED VIA
0556   ;       THE GENERAL REGISTERS R0, R1, AND R2, AND THE UCB.
0556   ;
0556   ;       R0 = DRIVE STATUS REGISTER.
0556   ;       R1 = MBA STATUS REGISTER.
0556   ;       R2 = DRIVE ERROR REGISTER 1.
0556   ;
0556   ;       UCB$W_EC1(R5) = ECC POSITION REGISTER.
0556   ;       UCB$W_EC2(R5) = ECC PATTERN REGISTER.
0556   ;       UCB$W_BCR(R5) = BYTE COUNT REGISTER.
0556   ;       UCB$W_DR_ER2(R5) = DRIVE ERROR REGISTER 2.
```

```
                           0556  ;
                           0556
                           0556  FEX:                                              ;FUNCTION EXECUTOR
            009C C5 8ED0   0556              POPL    UCB$L_DPC(R5)                 ;SAVE DRIVER PC VALUE
         0093 C5   50  90  055B              MOVB    R0,UCB$B_CEX(R5)              ;SAVE CASE INDEX
         53   0091 C5  9A  0560              MOVZBL  UCB$B_SLAVE+1(R5),R3          ;GET DRIVE OFFSET CONSTANT
       53   0400 C443  DE  0565              MOVAL   MBA$L_ERB(R4)[R3],R3          ;GET ADDRESS OF DRIVE REGISTERS
  38 A5   00008000 8F  D3  056B              BITL    #DEV$M_DUA,UCB$L_DEVCHAR(R5)  ;DUAL PORTED DRIVE?
                   48  12  0573              BNEQ    SEIZE                         ;IF NEQ, YES
      50   0093 C5     9A  0575  GO:         MOVZBL  UCB$B_CEX(R5),R0              ;Restore case index (func. code)
                           057A              CASE    R0,<-                         ;DISPATCH TO PROPER FUNCTION ROUTINE
                           057A                      POSIT,-                       ;SEEK CYLINDER
                           057A                      EXFNC,-                       ;RECALIBRATE
                           057A                      IMMED,-                       ;DRIVE CLEAR
                           057A                      IMMED,-                       ;RELEASE DRIVE
                           057A                      IMMED,-                       ;OFFSET HEADS
                           057A                      EXFNC,-                       ;RETURN TO CENTERLINE
                           057A                      IMMED,-                       ;PACK ACKNOWLEDGE
                           057A                      POSIT,-                       ;SEARCH FOR SECTOR
                           057A                      XFER,-                        ;WRITE CHECK
                           057A                      XFER,-                        ;WRITE DATA
                           057A                      XFER,-                        ;READ DATA
                           057A                      XFER,-                        ;WRITE HEADER AND DATA
                           057A                      XFER,-                        ;READ HEADER AND DATA
                           057A                      XFER,-                        ;WRITE TRACK DESCRIPTOR
                           057A                      XFER,-                        ;READ TRACK DESCRIPTOR
                           057A                      IMMED,-                       ;AVAILABLE
                           057A                      XFER,-                        ;WRITE CHECK HEADER AND DATA
                           057A                      IMMED,-                       ;READIN PRESET
                           057A                      EXFNC,-                       ;DIAGNOSE
                           057A                      SEARCHA,-                     ;SEARCH AHEAD
                           057A                      >,LIMIT=#CDF_SEEK             ;
                           05A6
                           05A6  ;
                           05A6  ; IMMEDIATE FUNCTION EXECUTION
                           05A6  ;
                           05A6  ;       FUNCTIONS INCLUDE:
                           05A6  ;
                           05A6  ;               NO OPERATION,
                           05A6  ;               DRIVE CLEAR,
                           05A6  ;               RELEASE PORT,
                           05A6  ;               OFFSET,
                           05A6  ;               READ IN PRESET, AND
                           05A6  ;               PACK ACKNOWLEDGE.
                           05A6  ;
                           05A6  ; Two other functions which might (but hopefully don't) pass through this code
                           05A6  ; are UNLOAD and AVAILABLE.  If such functions get here they are treated as
                           05A6  ; NOPs.
                           05A6  ;
                           05A6  ; THESE FUNCTIONS ARE EXECUTED IMMEDIATELY AND THE FINAL DEVICE REGISTERS
                           05A6  ; ARE RETURNED TO THE CALLER.
                           05A6  ;
                           05A6
                           05A6  IMMED:                                            ;IMMEDIATE FUNCTION EXECUTION
                           05A6          DSBINT                                    ;DISABLE INTERRUPTS
      09 64 A5   05    E0  05AC          BBS     #UCB$V_POWER,UCB$W_STS(R5),10$ ;IF SET, POWER HAS FAILED
            63   09    9A  05B1          MOVZBL  #F_DRVCLR!1,RM_CS1(R3)  ;CLEAR DRIVE ERRORS
```

```
   63    FADF CF40    9A  05B4          MOVZBL  FTAB[R0],RM_CS1(R3)       ;EXECUTE FUNCTION
              0108    31  05BA  10$:    BRW     ENBXIT                    ;
                          05BD
                          05BD  ;
                          05BD  ; ATTEMPT TO SEIZE THE PORT ON A DUAL PORTED DISK.
                          05BD  ;
                          05BD
    B2 00D4 C5    03  E1  05BD  SEIZE:  BBC     #DR_V_DUALPORT, -         ; IF CLEAR, DUALPORT KIT
                          05C3                  UCB$B_DR_SSTS(R5),GO      ;IS NOT PRESENT
   51    00000064 8F  D0  05C3          MOVL    #100,R1                   ; Initialize count for the number of
                          05CA                                            ;   times we will accept the loss of
                          05CA                                            ;   the port while we are on the I/O
                          05CA                                            ;   fork queue.
                          05CA  2$:     DSBINT                            ;DISABLE INTERRUPTS
             04 A3    D4  05D0          CLRL    RM_DS(R3)                 ;ATTEMPT TO SEIZE PORT
       00000100 8F    D3  05D3          BITL    #RM_DS_M_DPR,-            ;DID WE SEIZE THE PORT?
             04 A3        05D9                  RM_DS(R3)
                16    12  05DB          BNEQ    4$                        ;IF NEQ, WE SEIZED THE PORT
                          05DD          WFIKPCH RETREG,#15                ;LETS WAIT FOR THE PORT, ELSE TIMEOUT
                          05E7          IOFORK                            ;CREATE FORK PROCESS
             DA 51    F4  05ED          SOBGEQ  R1,2$                     ; Loop to make sure we really still
                          05F0                                            ;   have the port after we are dequeued
                          05F0                                            ;   off the I/O fork queue.
              00D8    31  05F0          BRW     RETREG                    ; Otherwise, error - We keep losing the
                          05F3                                            ;   port and we've retried enough.
                          05F3  4$:     ENBINT                            ;ENABLE INTERRUPTS
              FF7C    31  05F6          BRW     GO                        ;LET'S CONTINUE, WE HAVE THE PORT
                          05F9
                          05F9  ;
                          05F9  ; SEARCH AHEAD FUNCTION EXECUTION
                          05F9  ;
                          05F9  ; THIS FUNCTION MINIMIZES ROTATIONAL LATENCY BY SEARCHING FOR THE SECTOR THAT IS
                          05F9  ; FOUR SECTORS AHEAD OF THE STARTING SECTOR OF A TRANSFER.
                          05F9  ;
                          05F9  ; THE DESIRED CYLINDER, TRACK, AND SECTOR ADDRESS REGISTERS ARE LOADED, THE
                          05F9  ; FUNCTION IS INITIATED, AND A WAITFOR INTERRUPT IS EXECUTED. WHEN THE INTER-
                          05F9  ; RUPT OCCURS, THE FINAL DEVICE REGISTERS ARE RETURNED TO THE CALLER.
                          05F9  ;
                          05F9
                          05F9  SEARCHA:                                  ;
   51    00BC C5      3C  05F9          MOVZWL  UCB$W_DA(R5),R1           ;GET DESIRED TRACK AND SECTOR ADDRESS
        51    04      82  05FE          SUBB    #4,R1                     ;COMPUTE FOUR SECTORS BEFORE IT
                04    18  0601          BGEQ    10$                       ;IF GEQ BEFORE SECTOR ZERO
     51    44 A5      80  0603          ADDB    UCB$B_SECTORS(R5),R1      ;CONVERT TO AFTER SECTOR ZERO
     14 A3    51      D0  0607  10$:    MOVL    R1,RM_DA(R3)              ;SET TRACK AND SECTOR ADDRESS
                15    11  060B          BRB     LDCYL                     ;
                          060D
                          060D  ;
                          060D  ; TRANSFER FUNCTION EXECUTION
                          060D  ;
                          060D  ;       FUNCTIONS INCLUDE:
                          060D  ;
                          060D  ;               WRITE TRACK DESCRIPTOR,
                          060D  ;               WRITE CHECK,
                          060D  ;               WRITE CHECK HEADER AND DATA,
                          060D  ;               WRITE DATA,
                          060D  ;               WRITE HEADER AND DATA,
                              060D  ;                READ TRACK DESCRIPTOR,
                              060D  ;                READ DATA, AND
                              060D  ;                READ HEADER AND DATA.
                              060D  ;
                              060D  ; THE MAP REGISTERS, BYTE COUNT REGISTER, AND VIRTUAL ADDRESS REGISTER ARE
                              060D  ; LOADED FOLLOWED BY THE DESIRED CYLINDER, TRACK, AND SECTOR ADDRESS REGISTERS.
                              060D  ; THE FUNCTION IS INITIATED AND A WAITFOR INTERRUPT IS EXECUTED. WHEN THE
                              060D  ; INTERRUPT OCCURS, THE FINAL DEVICE REGISTERS ARE RETURNED TO THE CALLER.
                              060D  ;
                              060D  ; IT ASSUMED THAT THE CALLER OWNS THE CHANNEL ON WHICH THE I/O IS TO OCCUR.
                              060D  ;
                              060D
                              060D  XFER:                                        ;TRANSFER FUNCTION EXECUTION
      08 A4    00        D2   060D          MCOML   #0,MBA$L_SR(R4)              ;CLEAR MASSBUS ADAPTER ERRORS
                              0611          LOADMBA                              ;LOAD MAP, BYTE COUNT, AND VIRTUAL ADDRESS
     50    0093 C5       9A   0617          MOVZBL  UCB$B_CEX(R5),R0             ;RETRIEVE FUNCTION TABLE INDEX
                              061C
                              061C  ;
                              061C  ; POSITIONING FUNCTION EXECUTION
                              061C  ;
                              061C  ;       FUNCTIONS INCLUDE:
                              061C  ;
                              061C  ;                SEEK CYLINDER, AND
                              061C  ;                SEARCH FOR SECTOR.
                              061C  ;
                              061C  ; THE DESIRED CYLINDER, TRACK, AND SECTOR ADDRESS REGISTERS ARE LOADED, THE
                              061C  ; FUNCTION IS INITIATED, AND A WAITFOR INTERRUPT IS EXECUTED. WHEN THE INTER-
                              061C  ; RUPT OCCURS, THE FINAL DEVICE REGISTERS ARE RETURNED TO THE CALLER.
                              061C  ;
                              061C
                              061C  POSIT:                                       ;POSITION FUNCTION EXECUTION
   14 A3    00BC C5      3C   061C          MOVZWL  UCB$W_DA(R5),RM_DA(R3)       ;SET DESIRED TRACK AND SECTOR ADDRESS
                              0622  LDCYL:                                       ;
   28 A3    00BE C5      3C   0622          MOVZWL  UCB$W_DC(R5),RM_DC(R3)       ;SET DESIRED CYLINDER ADDRESS
                              0628
                              0628  ;
                              0628  ; INTERRUPT WAIT FUNCTION EXECUTION
                              0628  ;
                              0628  ;       FUNCTIONS INCLUDE:
                              0628  ;
                              0628  ;                DIAGNOSE,
                              0628  ;                RECALIBRATE, AND
                              0628  ;                RETURN TO CENTERLINE.
                              0628  ;
                              0628  ; THE OFFSET REGISTER IS LOADED, THE FUNCTION IS INITIATED, AND A WAITFOR
                              0628  ; INTERRUPT IS EXECUTED. WHEN THE INTERRUPT OCCURS, THE FINAL DEVICE REGISTERS
                              0628  ; ARE RETURNED TO THE CALLER.
                              0628  ;
                              0628
                              0628  EXFNC:                                       ;EXECUTE FUNCTION
             63    09    9A   0628          MOVZBL  #F_DRVCLR!1,RM_CS1(R3)       ;CLEAR DRIVE ERRORS
   30 0004 C5    01      E1   062B          BBC     #DR_V_OM,UCB$B_DR_SSTS(R5),10$   ;IF CLR, NO OFFSET ACTIVE
             63    0D    9A   0631          MOVZBL  #F_OFFSET!1,RM_CST(R3)       ;SET DRIVE IN OFFSET MODE
                   07    91   0634          CMPB    #DT$_RP07,-                  ; Is this drive an RP07?
                41 A5         0636                  UCB$B_DEVTYPE(R5)            ;
                   27    12   0638          BNEQ    10$                          ; If not, no need to wait.
                              063A          TIMEWAIT -                           ; Wait for 5 milliseconds or until
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                            063A               TIME = #5000,-           ;  go bit clears.
                            063A               BITVAL = #1,-            ;
                            063A               SOURCE = RM_CS1(R3),-    ;
                            063A               CONTEXT = L,-            ;
                            063A               SENSE = .FALSE.          ;
                            0661  10$:   DSBINT                         ;DISABLE INTERRUPTS
   5C 64 A5     05      E0  0667         BBS     #UCB$V_POWER,UCB$W_STS(R5),ENBXIT ;IF SET, POWER FAILED
 0C A3    00D2 C5       3C  066C         MOVZWL  UCB$W_DR_MR(R5),RM_MR(R3)         ;SET DIAGNOSTIC INFO
 24 A3    00C8 C5       3C  0672         MOVZWL  UCB$W_OFFSET(R5),RM_OF(R3) ;SET FORMAT, INHIBIT BITS, AND OFFSET
                09      E1  0678         BBC     #RM_OF_V_SSEI,-          ; If Skip Sector Error Inhibit is clear
       0F 00C8 C5           067A                 UCB$W_OFFSET(R5),12$     ;  branch around.
                09      E0  067E         BBS     #IO$V_SKPSECINH,-        ; If reason for SSEI is EXPLICIT user
       09 009A C5           0680                 UCB$W_FUNC(R5),12$       ;  request, then branch around.
                02      8A  0684         BICB    #RM_OF_M_SSEI/256,-      ; If here, SSEI set due to error on
          00C9 C5           0686                 UCB$W_OFFSET+1(R5)       ;  this track. Hence clear SSEI in
          00BC C5       97  0689         DECB    UCB$W_DA(R5)             ;  software only and decrement sector
                            068D                                          ;  bias in software also.
                            068D  12$:
 52    04 A3    13      78  068D         ASHL    #31-RM_DS_V_MOL,RM_DS(R3),R2 ;MEDIUM ONLINE?
                1E      18  0692         BGEQ    15$                      ;IF GEQ NO
  63    F9FF CF40       9A  0694         MOVZBL  FTAB[R0],RM_CS1(R3)      ;INITIATE FUNCTION
                            069A         WFIKPCH RETREG,#6                ;WAITFOR INTERRUPT AND KEEP CHANNEL
 00CC C5     08 A4      D0  06A4         MOVL    MBA$L_SR(R4),UCB$L_DR_SR(R5) ;SAVE FINAL CONTROLLER STATUS
                            06AA         IOFORK                           ;CREATE FORK PROCESS
                19      11  06B0         BRB     RETREG                   ;
                            06B2
                            06B2  ;
                            06B2  ; MEDIUM OFFLINE AT START OF FUNCTION
                            06B2  ;
                            06B2
                            06B2  15$:   ENBINT                           ;ENABLE INTERRUPTS
          0093 C5       94  06B5         CLRB    UCB$B_CEX(R5)            ;FORCE DRIVE FUNCTION
    50    4000 8F       3C  06B9         MOVZWL  #RM_DS_M_ERR,R0          ;SET DRIVE ERROR
          00CC C5       D4  06BE         CLRL    UCB$L_DR_SR(R5)          ;CLEAR SAVED MBA STATUS REGISTER
          00D5 C5       96  06C2         INCB    UCB$B_DR_ERL(R5)         ;SET MEDIUM OFFLINE FOR ERROR LOG
                35      11  06C6         BRB     ERROR                    ;
                            06C8
                            06C8  ;
                            06C8  ; ENABLE INTERRUPTS
                            06C8  ;
                            06C8
                            06C8  ENBXIT:                                 ;
                            06C8         ENBINT                           ;ENABLE INTERRUPTS
                            06CB
                            06CB  ;
                            06CB  ; RETURN REGISTERS
                            06CB  ;
                            06CB
                            06CB  RETREG:                                 ;RETURN FINAL DEVICE REGISTERS
 00D0 C5     34 A3      F7  06CB         CVTLW   RM_ER2(R3),UCB$W_DR_ER2(R5) ;SAVE ERROR REGISTER 2
 00C4 C5     38 A3      F7  06D1         CVTLW   RM_EC1(R3),UCB$W_EC1(R5) ;SAVE ECC POSITION REGISTER
 00C6 C5     3C A3      F7  06D7         CVTLW   RM_EC2(R3),UCB$W_EC2(R5) ;SAVE ECC PATTERN REGISTER
                            06DD  ; Here we save the more conservative of the two byte counts contained in
                            06DD  ;      the MBA$L_BCR register.  The high word of this register is the
                            06DD  ;      (negative of the) number of bytes transferred to or from the
                            06DD  ;      drive, while the low word is the (negative of the) number of
                            06DD  ;      bytes transferred to or memory.  On a read, the more conservative
```

```
                        06DD  ;         value is that of the number of bytes transferred to memory (low word)
                        06DD  ;         while on a write the more conservative value is the number of
                        06DD  ;         bytes transferred to the drive (high word).  Here we deposit
                        06DD  ;         the entire register into a longword in the UCB.  If the operation
                        06DD  ;         was a read we leave the value as is.  However if the operation
                        06DD  ;         was a write (or anything but a read) we move the high word to
                        06DD  ;         the low word in memory.  All other pieces of this driver use the
                        06DD  ;         low word of this longword as the valid byte count.
                        06DD
              10 A4  D0 06DD            MOVL    MBA$L_BCR(R4),-              ; Save entire byte count register
            00D8 C5     06E0                    UCB$L_DR_BCR(R5)             ;  in the UCB.
       50     58 A5  D0 06E3            MOVL    UCB$L_IRP(R5),R0             ; Retrieve IRP pointer.
                 01  E0 06E7            BBS     #IRP$V_FUNC,-                ; If we had a read operation then
           07 2A A0     06E9                    IRP$W_STS(R0),5$             ;  just branch around since all OK.
            00DA C5  B0 06EC            MOVW    UCB$L_DR_BCR+2(R5),-         ; If NOT read, then copy high word to
            00D8 C5     06F0                    UCB$L_DR_BCR(R5)             ;  low order word for later use.
                        06F3  5$:
  00D6 C5     24 A3  F7 06F3            CVTLW   RM_OF(R3),UCB$W_DR_OFR(R5)   ;SAVE OFFSET REGISTER
       50     04 A3  D0 06F9            MOVL    RM_DS(R3),R0                 ;GET CONTENTS OF DRIVE STATUS REGISTER
                        06FD  ERROR:                                         ;
     51     00CC C5  D0 06FD            MOVL    UCB$L_DR_SR(R5),R1           ;RETRIEVE FINAL CONTROLLER STATUS
       52     08 A3  D0 0702            MOVL    RM_ERT(R3),R2                ;GET CONTENTS OF DRIVE ERROR REGISTER 1
  64 A5     0060 8F  B3 0706            BITW    #UCB$M_POWER!-               ;POWER FAIL OR DEVICE TIMEOUT?
                        070C                    UCB$M_TIMOUT,UCB$W_STS(R5)   ;
                 03  13 070C            BEQL    10$                          ;IF EQL - NO
               0137  31 070E            BRW     SPECOND                      ;BRANCH TO SPECIAL CONDITION
     0093 C5     15  91 0711  10$:      CMPB    #CDF_SEARCHA, UCB$B_CEX(R5)  ;Search Ahead?
                 5F  13 0716            BEQL    SAFUNC                       ;Branch to special search-ahead code.
     0093 C5     0A  91 0718            CMPB    #CDF_WRITECHECK,UCB$B_CEX(R5)  ;DRIVE RELATED FUNCTION?
                 07  1A 071D            BGTRU   20$                          ;IF GTRU - YES
     0093 C5     13  91 071F            CMPB    #CDF_READPRESET,UCB$B_CEX(R5) ;DRIVE RELATED FUNCTION?
                 03  1A 0724            BGTRU   30$                          ;IF GTRU - NO
               0083  31 0726  20$:      BRW     DFUNC                        ;DRIVE FUNCTION
                        0729
                        0729  ;
                        0729  ; CHECK FOR RM80 SKIP SECTOR ERROR
                        0729  ;
                        0729
       41 A5     0D  91 0729  30$:      CMPB    #DT$_RM80,UCB$B_DEVTYPE(R5)   ;RM80?
                 56  12 072D            BNEQ    CFUNC                        ;IF NEQ - NO
                 05  E1 072F            BBC     #RM_ER2_V_SSE,-              ; If clear, No Skip Sectoring error,
         50 00D0 C5     0731                    UCB$W_DR_ER2(R5),CFUNC       ;  so branch around.
     52     0180 8F  B3 0735            BITW    #RM_ER1_M_HCE!RM_ER1_M_HCRC,R2  ;HEADER COMPARE OR HDR CRC ERR?
                 49  12 073A            BNEQ    CFUNC                        ;IF NEQ - YES
     00C9 C5     02  88 073C            BISB    #RM_OF_M_SSEI/256,UCB$W_OFFSET+1(R5)   ;SET SKIP SECTOR INHIBIT
                 50  DD 0741            PUSHL   R0                           ;SAVE R0 (DRIVE STATUS REGISTER)
     50     00D8 C5  3C 0743            MOVZWL  UCB$L_DR_BCR(R5),R0          ; Get negative bytes remaining
                 05  12 0748            BNEQ    40$                          ;IF NEQ - PARTIAL TRANSFER
     50     FFFF 8F  B0 074A            MOVW    #-1,R0                       ;FAKE A PARTIAL TRANSFER
       50     7E A5  A0 074F  40$:      ADDW    UCB$W_BCNT(R5),R0            ;CALCULATE BYTES TRANSFERRED
     50     01FF 8F  AA 0753            BICW    #^X1FF,R0                    ;TRUNCATE TO LAST BLOCK TRANSFERRED
        00000000'GF  16 0758            JSB     G^IOC$UPDATRANSP             ;UPDATE TRANSFER PARAMETERS
            008C C5  96 075E            INCB    UCB$W_DA(R5)                 ;INCREMENT TO NEXT SECTOR
                 50 8ED0 0762           POPL    R0                           ;RESTORE R0 (DRIVE STATUS REGISTER)
  03 00D4 C5     00  E0 0765            BBS     #DR_V_DCK,UCB$B_DR_SSTS(R5),45$  ;IF SET - DATACHECK IN PROGRESS
               FB22  31 076B            BRW     TRANNOCH                     ;RESTART TRANSFER
                        076E  45$:      RELCHAN                              ;RELEASE CHANNEL
```

```
             FB70   31  0774                 BRW     CHECKRETRY                      ;RESTART DATA CHECK
                        0777                                                         ;NO SSE - CHECK FOR TRACK-TRACK SSEI CLR
                        0777                 .ENABL  LSB
                        0777
                        0777    ;
                        0777    ; SEARCH AHEAD ERROR CHECKING
                        0777    ;
                        0777
                        0777    SAFUNC:
    7A 00D0 C5   0E     E1  0777             BBC     #RM_ER2_V_SKI, -                ;The only error worth checking on
                        077D                         UCB$W_DR_ER2(R5), 30$           ;seach-ahead is seek incomplete.
        00000000'GF     16  077D             JSB     G^ERL$DEVICERR                  ;SKI errors, however, must be logged
                 68     11  0783             BRB     25$                             ;and retried.
                        0785
                        0785    ;
                        0785    ; CONTROLLER RELATED FUNCTION
                        0785    ;
                        0785
                        0785    CFUNC:
51    000E5FFF 8F       D3  0785             BITL    #MBA$M_ERROR,R1                 ;ANY CONTROLLER ERRORS?
                 69     13  078C             BEQL    30$                             ;IF EQL NO
        00000000'GF     16  078E             JSB     G^ERL$DEVICERR                  ;ALLOCATE AND FILL ERROR MESSAGE BUFFER
 66 009A C5      0F     E0  0794             BBS     #IO$V_INHRETRY,UCB$W_FUNC(R5),40$ ;IF SET, RETRY INHIBITED
51    0008000B 8F       D3  079A             BITL    #MBA$M_SR_ERCONF!-              ;ERROR CONFIRMATION OR,
                        07A1                         MBA$M_SR_ISTO!-                 ;INTERFACE SEQUENCE TIMEOUT OR,
                        07A1                         MBA$M_SR_PGE!-                  ;PROGRAMMING ERROR OR,
                        07A1                         MBA$M_SR_RDTO,R1                ;READ TIMEOUT?
                 5D     12  07A1             BNEQ    40$                             ;IF NEQ YES - FATAL CONTROLLER ERROR
51    00064FF4 8F       D3  07A3             BITL    #MBA$M_SR_DLT!-                 ;DATA LATE OR,
                        07AA                         MBA$M_SR_INVMAP!-               ;INVALID MAP REGISTER OR,
                        07AA                         MBA$M_SR_MAPPE!-                ;MAP REGISTER PARITY ERROR OR,
                        07AA                         MBA$M_SR_MBEXC!-                ;MASSBUS EXCEPTION OR,
                        07AA                         MBA$M_SR_MCPE!-                 ;MASSBUS CONTROL PARITY ERROR OR,
                        07AA                         MBA$M_SR_SPE!-                  ;MBA SILO PARITY ERROR OR,
                        07AA                         MBA$M_SR_MDPE!-                 ;MASSBUS DATA PARITY ERROR OR,
                        07AA                         MBA$M_SR_MXF!-                  ;MISSED TRANSFER OR,
                        07AA                         MBA$M_SR_NED!-                  ;NONEXISTENT DRIVE OR,
                        07AA                         MBA$M_SR_RDS!-                  ;READ DATA SUBSTITUTE OR,
                        07AA                         MBA$M_SR_WCKLWR!-               ;WRITE CHECK LOWER BYTE OR,
                        07AA                         MBA$M_SR_WCKUPR,R1              ;WRITE CHECK UPPER BYTE?
                 1B     12  07AA             BNEQ    20$                             ;IF NEQ YES - RETRIABLE CONTROLLER ERROR
                        07AC
                        07AC    ;
                        07AC    ; DRIVE RELATED FUNCTION
                        07AC    ;
                        07AC
                        07AC    DFUNC:
      47 50      0E     E1  07AC    10$:     BBC     #RM_DS_V_ERR,R0,30$             ;IF CLR, NO DRIVE ERRORS
            7E   A5     AE  07B0             MNEGW   UCB$W_BCNT(R5),-
               00D8     C5  07B3                     UCB$L_DR_BCR(R5)                ; Reset byte count - NO TRANSFER
    45 00D5      C5     E8  07B6             BLBS    UCB$B_DR_ERL(R5),40$            ; Don't log error if Medium offline at
                        07BB                                                         ;   start of function.
        00000000'GF     16  07BB             JSB     G^ERL$DEVICERR                  ;ALLOCATE AND FILL ERROR MESSAGE BUFFER
 39 009A C5      0F     E0  07C1             BBS     #IO$V_INHRETRY,UCB$W_FUNC(R5),40$ ;IF SET, RETRY INHIBITED
      35 50      0C     E1  07C7    20$:     BBC     #RM_DS_V_MOL,R0,40$             ;IF CLR, MEDIUM OFFLINE
      31 50      06     E1  07CB             BBC     #RM_DS_V_VV,R0,40$              ;IF CLR, INVALID VOLUME
52      0180 8F     B3  07CF             BITW    #RM_ERT_M_HCRC!-                ; Check HCRC and HCE before checking
```

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                        07D4                 RM_ER1_M_HCE,R2            ;  BSE and FER.
                 17  12 07D4         BNEQ    25$                        ; NEQ means HCRC or HCE is set.
      52    0E17 8F  B3 07D6         BITW    #RM_ER1_M_AOE!-            ;ADDRESS OVERFLOW OR,
                        07DB                 RM_ER1_M_FER!-             ;FORMAT ERROR OR,
                        07DB                 RM_ER1_M_IAE!-             ;INVALID ADDRESS OR,
                        07DB                 RM_ER1_M_ILF!-             ;ILLEGAL FUNCTION OR,
                        07DB                 RM_ER1_M_ILR!-             ;ILLEGAL REGISTER OR,
                        07DB                 RM_ER1_M_RMR!-             ;REGISTER MODIFY REFUSE OR,
                        07DB                 RM_ER1_M_WLE,R2            ;WRITE LOCK ERROR?
                 23  12 07DB         BNEQ    40$                        ;IF NEQ YES - FATAL DRIVE ERROR
 00D0 C5    A000 8F  B3 07DD         BITW    #RM_ER2_M_BSE!-            ;BAD SECTOR ERROR OR,
                        07E4                 RM_ER2_M_OPE,UCB$W_DR_ER2(R5) ;OPERATOR PLUG ERROR?
                 1A  12 07E4         BNEQ    40$                        ;IF NEQ YES - FATAL DRIVE ERROR
      52    4000 8F  B3 07E6         BITW    #RM_ER1_M_UNS,R2           ; Is the drive unsafe?
                 16  12 07EB         BNEQ    45$                        ; Branch if so.
                        07ED
                        07ED ;
                        07ED ; RETRIABLE ERROR EXIT
                        07ED ;
                        07ED
   7E   009C D5      32 07ED 25$:    CVTWL   @UCB$L_DPC(R5),-(SP)       ;GET BRANCH DISPLACEMENT
 009C C5      8E     C0 07F2         ADDL    (SP)+,UCB$L_DPC(R5)        ;CALCULATE RETURN ADDRESS - 2
 009C C5      02     C0 07F7 30$:    ADDL    #2,UCB$L_DPC(R5)           ;SKIP PAST BRANCH DISPLACEMENT WORD
        009C D5      17 07FC         JMP     @UCB$L_DPC(R5)             ;RETURN TO DRIVER
                        0800
                        0800 ;
                        0800 ; FATAL CONTROLLER OR DRIVE ERROR EXIT
                        0800 ;
                        0800
            FC70     31 0800 40$:    BRW     FATALERR                   ;
                        0803
                        0803 ;
                        0803 ; Check for unsafe condition and attempt to clear it.
                        0803 ;
                        0803
                        0803 45$:    DSBINT                             ; Disable interupts.
              05     E1 0809         BBC     #UCB$V_POWER,-             ; Branch if no power failure occured.
        03 64 A5        080B                 UCB$W_STS(R5),47$          ;
            FEB7     31 080E         BRW     ENBXIT                     ; Otherwise, enable interupts and
                        0811                                            ;  go process error.
      63      09     9A 0811 47$:    MOVZBL  #F_DRVCLR!1,RM_CS1(R3)     ; Attempt to clear unsafe condition.
                        0814         TIMEWAIT -                         ; Wait for ten microseconds or until
                        0814                 TIME = #1,-                ;  unsafe condition clears.
                        0814                 BITVAL = #RM_ER1_M_UNS,-   ;
                        0814                 SOURCE = RM_ER1(R3),-      ;
                        0814                 CONTEXT = L,-              ;
                        0814                 SENSE = .FALSE.            ;
                        083C         ENBINT                             ; Enable interupts.
      52      08 A3  D0 083F         MOVL    RM_ER1(R3),R2              ; Retrieve error status.
              A7 50  E8 0843         BLBS    R0,25$                     ; Branch if drive is no longer unsafe.
                 B8  11 0846         BRB     40$                        ; Otherwise, fatal error.
                        0848
                        0848 ;
                        0848 ; SPECIAL CONDITION (POWER FAILURE OR DEVICE TIME OUT)
                        0848 ;
                        0848
                        0848 SPECOND:
```

```
 61 64 A5    05    E4  0848  50$:    BBSC    #UCB$V_POWER,UCB$W_STS(R5),70$ ;IF SET, POWER FAILURE
                       084D
                       084D  ;
                       084D  ; DEVICE TIME OUT
                       084D  ;
                       084D
   00000000'GF     16  084D          JSB     G^ERL$DEVICTMO            ;LOG DEVICE TIME OUT
      53   24 A5   D0  0853          MOVL    UCB$L_CRB(R5),R3          ;GET ADDRESS OF CRB
      53   2C A3   D0  0857          MOVL    CRB$L_INTD+VEC$L_IDB(R3),R3 ;GET ADDRESS OF IDB
     04 A3    55   D1  085B          CMPL    R5,IDB$L_OWNER(R3)        ;DEVICE OWN CONTROLLER?
              22   12  085F          BNEQ    60$                       ;IF NEQ NO
                       0861          DSBINT                            ;DISABLE INTERRUPTS
              06   D0  0867          MOVL    #MBA$M_CR_ABORT!MBA$M_CR_IE,- ;ABORT THE DATA TRANSFER
           04 A4       0869                  MBA$L_CR(R4)              ;
                       086B          WFIKPCH 55$,#T5                   ;WAIT FOR ABORT AND KEEP CHANNEL
                       0875          IOFORK                            ;CREATE FORK PROCESS
                       087B  55$:
     04 A4    01   D0  087B          MOVL    #MBA$M_CR_INIT,MBA$L_CR(R4) ;INITIALIZE ENTIRE MBA
     04 A4    04   D0  087F          MOVL    #MBA$M_CR_IE,MBA$L_CR(R4) ;ENABLE DEVICE INTERRUPTS
                       0883  60$:    SETIPL  UCB$B_FIPL(R5)            ;LOWER TO FORK LEVEL
   50    022C 8F   3C  0887          MOVZWL  #SS$_TIMEOUT,R0           ;SET DEVICE TIMEOUT STATUS
         0080 C5   97  088C          DECB    UCB$B_ERTCNT(R5)          ;ANY ERROR RETRIES REMAINING?
              0F   13  0890          BEQL    RESETXFR                  ;IF EQL NO
                       0892          RELCHAN                           ;RELEASE CHANNEL IF OWNED
 64 A5   0040 8F   AA  0898          BICW    #UCB$M_TIMOUT,UCB$W_STS(R5) ;CLEAR TIME OUT STATUS
            F919   31  089E          BRW     FDISPATCH                 ;
                       08A1
                       08A1  ;
                       08A1  ; RESET TRANSFER BYTE COUNT TO ZERO
                       08A1  ;
                       08A1
                       08A1  RESETXFR:                                 ;
      53   58 A5   D0  08A1          MOVL    UCB$L_IRP(R5),R3          ;RETRIEVE ADDRESS OF I/O PACKET
           32 A3   AE  08A5          MNEGW   IRP$W_BCNT(R3),-
         00D8 C5       08A8                  UCB$L_DR_BCR(R5)          ; Reset transfer byte count
            FC5D   31  08AB          BRW     FUNCXT                    ;
                       08AE
                       08AE  ;
                       08AE  ; POWER FAILURE
                       08AE  ;
                       08AE
                       08AE  70$:    RELCHAN                           ;RELEASE CHANNEL
      53   58 A5   D0  08B4          MOVL    UCB$L_IRP(R5),R3          ;RETRIEVE ADDRESS OF I/O PACKET
   78 A5   2C A3   7D  08B8          MOVQ    IRP$L_SVAPTE(R3),UCB$L_SVAPTE(R5) ;RESTORE TRANSFER PARAMETERS
            F886   31  08BD          BRW     DR_STARTIO                        ;
                       08C0          .DSABL  LSB
                       08C0
```

```
                                 08C0   1606          .SBTTL  REGISTER DUMP ROUTINE
                                 08C0   1607  ;
                                 08C0   1608  ; DR_REGDUMP - REGISTER DUMP ROUTINE
                                 08C0   1609  ;
                                 08C0   1610  ; THIS ROUTINE IS CALLED TO SAVE THE CONTROLLER AND DRIVE REGISTERS IN A
                                 08C0   1611  ; SPECIFIED BUFFER. IT IS CALLED FROM THE DEVICE ERROR LOGGING ROUTINE AND
                                 08C0   1612  ; FROM THE DIAGNOSTIC BUFFER FILL ROUTINE.
                                 08C0   1613  ;
                                 08C0   1614  ; INPUTS:
                                 08C0   1615  ;
                                 08C0   1616  ;       R0 = ADDRESS OF REGISTER SAVE BUFFER.
                                 08C0   1617  ;       R4 = ADDRESS OF ADAPTER CONFIGURATION REGISTER.
                                 08C0   1618  ;       R5 = DEVICE UNIT UCB ADDRESS.
                                 08C0   1619  ;
                                 08C0   1620  ; OUTPUTS:
                                 08C0   1621  ;
                                 08C0   1622  ;       THE CONTROLLER AND DRIVE REGISTERS ARE SAVED IN THE SPECIFIED BUFFER.
                                 08C0   1623  ;
                                 08C0   1624
                                 08C0   1625 DR_REGDUMP:                                            ;REGISTER DUMP ROUTINE
              80    18     D0    08C0   1626          MOVL    #<RM_EC2+4+MBA$L_BCR+4+8+4>/4,(R0)+ ;INSERT NUMBER OF DEVICE REGS
              80    64     D0    08C3   1627          MOVL    MBA$L_CSR(R4),(R0)+            ;SAVE CONFIGURATION REGISTER
           80    04 A4     D0    08C6   1628          MOVL    MBA$L_CR(R4),(R0)+             ;SAVE CONTROL REGISTER
        80    00CC C5      D0    08CA   1629          MOVL    UCB$L_DR_SR(R5),(R0)+          ;SAVE STATUS REGISTER
           80    0C A4     D0    08CF   1630          MOVL    MBA$L_VAR(R4),(R0)+            ;SAVE VIRTUAL ADDRESS REGISTER
           80    10 A4     D0    08D3   1631          MOVL    MBA$L_BCR(R4),(R0)+            ;SAVE BYTE COUNT REGISTER
  51   F8 A0    08    09     EF    08D7   1632          EXTZV   #9,#8,-8(R0),R1                ;GET FINAL MAP REGISTER NUMBER
       80    0800 C441     D0    08DD   1633          MOVL    MBA$L_MAP(R4)[R1],(R0)+        ;SAVE FINAL MAP REGISTER CONTENTS
                    80     D4    08E3   1634          CLRL    (R0)+                          ;ASSUME NO PREVIOUS MAP REGISTER
                    51     D7    08E5   1635          DECL    R1                             ;CALCULATE PREVIOUS MAP REGISTER NUMBER
                    07     19    08E7   1636          BLSS    10$                            ;IF LSS NONE
     FC A0   0800 C441     D0    08E9   1637          MOVL    MBA$L_MAP(R4)[R1],-4(R0)       ;SAVE PREVIOUS MAP REGISTER CONTENTS
              51    10     9A    08F0   1638 10$:     MOVZBL  #<RM_EC2+4>/4,R1               ;SET NUMBER OF DRIVE REGISTERS TO SAVE
        52    0091 C5      9A    08F3   1639          MOVZBL  UCB$B_SLAVE+1(R5),R2           ;GET DRIVE OFFSET CONSTANT
       52    0400 C442     DE    08F8   1640          MOVAL   MBA$L_ERB(R4)[R2],R2           ;GET ADDRESS OF DRIVE REGISTERS
              80    82     D0    08FE   1641 20$:     MOVL    (R2)+,(R0)+                    ;SAVE DRIVE REGISTER
                 FA 51     F5    0901   1642          SOBGTR  R1,20$                         ;ANY MORE TO SAVE?
        80    00D5 C5      9A    0904   1643          MOVZBL  UCB$B_DR_ERL(R5),(R0)+         ;SAVE MEDIUM OFFLINE INDICATOR
                           05    0909   1644          RSB                                    ;
                                 090A   1645
```

```
090A          .SBTTL  DISK DRIVE INITIALIZATION
090A    ;
090A    ; DR_UNIT_INIT - DISK DRIVE UNIT INITIALIZATION
090A    ;
090A    ; THIS ROUTINE IS CALLED AT SYSTEM INITIALIZATION AND AT POWER RECOVERY TO SET
090A    ; DRIVE PARAMETERS AND TO WAIT FOR ONLINE DRIVES TO SPIN UP.
090A    ;
090A    ; INPUTS:
090A    ;
090A    ;       R4 = ADDRESS OF MBA CONFIGURATION STATUS REGISTER.
090A    ;       R5 = DEVICE UNIT UCB ADDRESS.
090A    ;
090A    ; OUTPUTS:
090A    ;
090A    ;       UNIT PARAMETERS ARE ESTABLISHED AND THE DRIVE IS SPUN UP IF IT WAS ONLINE.
090A    ;
090A    ; SPECIAL NOTES:
090A    ;       This routine performs several special operations to support power
090A    ;       failure recovery in the RP07.  To provide an understanding of these
090A    ;       operations, power failure recovery within in the RP07 is discussed
090A    ;       first.  Then, the special actions taken by this routine are discussed.
090A    ;
090A    ;       The power up sequence in a RP07 drive is best described in terms of a
090A    ;       series of numbered states.  The state numbers are shown in the LED
090A    ;       readout on the micro-processor control pannel, the section labeled
090A    ;       "PROGRAM CODE."  The following lists these states and gives the
090A    ;       author's understanding what they mean.
090A    ;
090A    ;       STATE           COMMENTS
090A    ;       00,11,22,...,FF These states occur upon restoration of DC power.
090A    ;                       Presumably they are related to micro-processor
090A    ;                       initialization and testing.  During these states,
090A    ;                       no MASSBUS interaction with the drive is possible.
090A    ;
090A    ;       00,01,02        These states occur after the above states during power
090A    ;                       failure recovery or after the START/STOP switch is
090A    ;                       moved from the STOP to the START position.  These
090A    ;                       states also are related to micro-processor and disk
090A    ;                       system testing.  The disk system is not spinning
090A    ;                       during these states.  During these states, no
090A    ;                       MASSBUS interaction with the drive is possible.
090A    ;
090A    ;       03              During power failure recovery, this is the state in
090A    ;                       which multiple RP07 drives on a single system will
090A    ;                       synchronize their attempts to spin their disk media.
090A    ;                       Limited communication with the drive via the MASSBUS
090A    ;                       is enabled while the drive is in this state.  The
090A    ;                       drive type register can be read, and the clear-drive
090A    ;                       command is accepted.  The drive status register also
090A    ;                       can be read while the drive is in this state.  For
090A    ;                       between 20 and 40 milliseconds after this state is
090A    ;                       entered, however, the drive status register contains
090A    ;                       garbage -- probably all bits except ATA and ERR set,
090A    ;                       a remnant of some internal test.  After this initial
090A    ;                       period, the drive status register contains reasonable,
090A    ;                       valid information.
090A    ;
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                          090A   ;       04,05,06,07,08  These states occur while the disk medium is spining
                          090A   ;                       upto speed.  While in these states, no MASSBUS
                          090A   ;                       interaction with the drive is possible.
                          090A   ;
                          090A   ;       The following aspects of this routine relate specificially to dealing
                          090A   ;       with power failure recovery as practiced by the RP07.
                          090A   ;
                          090A   ;           o   The sieze port operation, performed near the beginning of this
                          090A   ;               routine, also has the effect of waiting for the RP07 drive to
                          090A   ;               reach state 03.  To allow both wait operations -- the sieze
                          090A   ;               port function and the wait for RP07 to reach state 03 function
                          090A   ;               -- to be combined, EXE$PWRTIMCHK is used to time both
                          090A   ;               functions.  When this routine is called for reasons other than
                          090A   ;               power failure recovery, it establishes a 20 millisecond wait
                          090A   ;               interval for EXE$PWRTIMCHK.
                          090A   ;
                          090A   ;           o   Once access to the RP07 has been established, this routine
                          090A   ;               proceeds to determine the drive type, that register can be
                          090A   ;               read and contains valid.
                          090A   ;
                          090A   ;           o   Before proceeding to test for medium-online, however, this
                          090A   ;               routine waits for 50 milliseconds.  This is intended to allow
                          090A   ;               the drive status register to reach a valid state.
                          090A   ;
                          090A   ;           o   The medium-online test will wait for the drive to spin up.
                          090A   ;               Because all drive registers show zero while MASSBUS access to
                          090A   ;               the drive is disabled, it will correctly wait throughout
                          090A   ;               states 03, 04, 05, 06, 07, and 08.
                          090A   ;
                          090A   ;
                          090A   DR_UNIT_INIT:                                 ;DISK DRIVE UNIT INITIALIZATION
      53   54 A5    3C    090A           MOVZWL  UCB$W_UNIT(R5),R3             ;GET DRIVE UNIT NUMBER
    0090 C5   53    90    090E           MOVB    R3,UCB$B_SLAVE(R5)            ;SET SLAVE UNIT NUMBER
         53   20    C4    0913           MULL    #<1@7>/4,R3                   ;CALCULATE DRIVE OFFSET CONSTANT
    0091 C5   53    90    0916           MOVB    R3,UCB$B_SLAVE+1(R5)          ;SET SLAVE OFFSET CONSTANT
  53   0400 C443    DE    091B           MOVAL   MBA$L_ERB(R4)[R3],R3          ;GET ADDRESS OF DRIVE CONTROL REGISTER
7E   00000000'GF    D0    0921           MOVL    G^EXE$GL_PWRDONE, -(SP)  ;Save current powerfail limit time.
              0E    12    0928           BNEQ    105$                          ;Non-zero value indicates powerfail.
   00000000'GF      16    092A           JSB     G^EXE$READ_TODR               ;If not powerfail, construct our
00000000'GF   50 02 C1    0930           ADDL3   #2,R0,G^EXE$GL_PWRDONE ;limit time for port seizure.
         04 A3      D4    0938   105$:   CLRL    RM_DS(R3)                     ;Attempt to seize port.
 52   04 A3   17    78    093B   110$:   ASHL    #3T-RM_DS_V_DPR, RM_DS(R3), R2 ;Did we seize the port?
              0F    19    0940           BLSS    120$                          ;If LSS, we seized the port.
   00000000'GF      16    0942           JSB     G^EXE$PWRTIMCHK               ;Wait for port to be siezed.
         F0   50    E8    0948           BLBS    R0, 110$                      ;Branch if haven't waited long enough.
      64 A5   10    AA    094B           BICW    #UCB$M_ONLINE, UCB$W_STS(R5) ;If never get the port,
              5D    11    094F           BRB     15$                           ;mark the drive offline and invalid.
 52   18 A3   14    78    0951   120$:   ASHL    #31-RM_DT_V_DRQ, RM_DT(R3), R2 ;Is there a dualport kit?
              05    18    0956           BGEQ    5$                            ;If GEQ, no dualport kit; continue.
    00D4 C5   08    88    0958           BISB    #DR_M_DUALPORT, -             ;Else, set flag indicating that disk
                          095D                   UCB$B_DR_SSTS(R5)             ;has a dualport kit.
      64 A5   10    A8    095D   5$:     BISW    #UCB$M_ONLINE,UCB$W_STS(R5) ;SET UNIT ONLINE
            00A5    30    0961           BSBW    DR_DTYPE                      ;CLASSIFY DRIVE TYPE
   45 64 A5   04    E1    0964           BBC     #UCB$V_ONLINE,UCB$W_STS(R5),15$ ;IF CLR, UNKNOWN DRIVE TYPE
   4B 64 A5   08    E1    0969           BBC     #UCB$V_VALID,UCB$W_STS(R5),30$  ;IF CLR, VOLUME SOFTWARE INVALID
      41 A5   07    91    096E           CMPB    #DT$_RP07, UCB$B_DEVTYPE(R5) ;Is this a RP07?
              27    12    0972           BNEQ    10$                           ; Branch if not a RP07.
```

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                                 0974  1761           .SHOW   MEB
                                 0974  1762           TIMEWAIT -                        ; If this is a RP07,
                                 0974  1763                   time = #5000, -           ; wait for it to finish its
                                 0974  1764                   bitval = #0, -            ; cup of coffee.
                                 0974  1765                   source = #0, -
                                 0974  1766                   context = B
                     50   01  3C 0974                 MOVZWL  #SS$_NORMAL,R0
51   00000000'GF   00001388 8F  C5 0977               MULL3   #5000,G^EXE$GL_TENUSEC,R1
                          7E  D4 0983                 CLRL    -(SP)
                     00   00  93 0985       30010$:   BITB    #0,#0
                          0F  12 0988                 BNEQ    30011$
              6E   00000000'GF  D0 098A               MOVL    G^EXE$GL_UBDELAY,(SP)
                       FD 6E  F5 0991       30012$:   SOBGTR  (SP),30012$
                       EE 51  F5 0994                 SOBGTR  R1,30010$
                          50  D4 0997                 CLRL    R0
                                 0999       30011$:
                          8E  D5 0999                 TSTL    (SP)+
                                 099B  1767           .NOSHOW MEB
                     63   09  9A 099B  1768 10$:      MOVZBL  #F_DRVCLR!1,RM_CS1(R3)   ;CLEAR DRIVE
            52   04 A3    13  78 099E  1769           ASHL    #31-RM_DS_V_MOL,RM_DS(R3),R2 ;MEDIUM ONLINE?
                          11  19 09A3  1770           BLSS    20$                      ;IF LSS YES
                   00000000'GF  16 09A5  1771         JSB     G^EXE$PWRTIMCHK          ;CHECK FOR MAXIMUM TIME EXCEEDED
                       ED 50  E8 09AB  1772           BLBS    R0,10$                   ;IF LBS MORE TIME TO GO
            64 A5    0800 8F  AA 09AE  1773 15$:      BICW    #UCB$M_VALID,UCB$W_STS(R5) ;MARK THE VOLUME INVALID
                          03  11 09B4  1774           BRB     30$
                     63   13  9A 09B6  1775 20$:      MOVZBL  #F_PACKACK!1,RM_CS1(R3) ;ACKNOWLEDGE PACK
                     63   0B  9A 09B9  1776 30$:      MOVZBL  #F_RELEASE!1,RM_CS1(R3) ;CLEAR DRIVE
             08 A4     08 A4  C8 09BC  1777 40$:      BISL    MBA$L_SR(R4), MBA$L_SR(R4) ;CLEAR MBA STATUS
                          8E  D5 09C1  1778           TSTL    (SP)+                    ;If powerfail limit time was zero
                          06  12 09C3  1779           BNEQ    50$                      ;when we started, make sure its
                   00000000'GF  D4 09C5  1780         CLRL    G^EXE$GL_PWRDONE         ;zero when we leave.
                              05 09CB  1781 50$:      RSB
```

```
                               09CC          .SBTTL  UNSOLICITED INTERRUPT ROUTINE
                               09CC    ;
                               09CC    ; DR_UNSOLNT - UNSOLICITED INTERRUPT ROUTINE
                               09CC    ;
                               09CC    ; THIS ROUTINE IS CALLED WHEN AN UNSOLICITED ATTENTION CONDITION IS DETECTED.
                               09CC    ;
                               09CC    ; INPUTS:
                               09CC    ;
                               09CC    ;       R4 = ADDRESS OF CONFIGURATION STATUS REGISTER.
                               09CC    ;       R5 = DEVICE UNIT UCB ADDRESS.
                               09CC    ;
                               09CC    ; OUTPUTS:
                               09CC    ;
                               09CC    ;       IF VOLUME VALID IS CLEAR, THEN SOFTWARE VOLUME VALID IS CLEARED. THE
                               09CC    ;       UNIT STATUS IS CHANGED TO ONLINE AND THE DRIVE TYPE AND PARAMETERS ARE
                               09CC    ;       CLASSIFIED.
                               09CC    ;
                               09CC
                               09CC  DR_UNSOLNT:                                           ;UNSOLICITED INTERRUPT
     53    0091 C5       9A    09CC           MOVZBL  UCB$B_SLAVE+1(R5),R3         ;GET DRIVE OFFSET CONSTANT
   53    0400 C443       DE    09D1           MOVAL   MBA$L_ERB(R4)[R3],R3         ;GET ADDRESS OF DRIVE CONTROL REGISTER
        64 A5    10      A8    09D7           BISW    #UCB$M_ONLINE,UCB$W_STS(R5)  ;SET UNIT ONLINE
               002B      30    09DB           BSBW    DR_DTYPE                     ;CLASSIFY DRIVE TYPE
    1F 64 A5     04      E1    09DE           BBC     #UCB$V_ONLINE,UCB$W_STS(R5),10$ ;IF CLR, UNKNOWN DRIVE TYPE
    20 64 A5     0B      E1    09E3           BBC     #UCB$V_VALID,UCB$W_STS(R5),20$ ;IF CLR, VOLUME SOFTWARE INVALID
  52    04 A3    13      78    09E8           ASHL    #31-RM_DS_V_MOL,RM_DS(R3),R2 ;MEDIUM ONLINE?
                 13      18    09ED           BGEQ    10$                          ;IF GEQ NO
    07 64 A5     08      E1    09EF           BBC     #UCB$V_BSY,UCB$W_STS(R5),5$ ;We know the drive is online; thus,
     0093 C5     08      91    09F4           CMPB    #CDF_PACKACK,UCB$B_CEX(R5)   ;if busy doing a PACKACK function,
                 0D      13    09F9           BEQL    20$                          ;then don't clear software valid.
  52    04 A3    19      78    09FB  5$:      ASHL    #31-RM_DS_V_VV,RM_DS(R3),R2 ;VOLUME VALID?
                 06      19    0A00           BLSS    20$                          ;IF LSS YES
  64 A5    0800 8F       AA    0A02  10$:     BICW    #UCB$M_VALID,UCB$W_STS(R5) ;CLEAR SOFTWARE VOLUME VALID
                         05    0A08  20$:     RSB                                  ;
```

```
                      0A09          .SBTTL  CLASSIFY DRIVE TYPE AND SET PARAMETERS
                      0A09  ;
                      0A09  ; RM_DTYPE - CLASSIFY DRIVE TYPE AND SET PARAMETERS
                      0A09  ;
                      0A09  ; THIS ROUTINE IS CALLED WHEN AN UNSOLICITED INTERRUPT OCCURS ON A DRIVE, DURING
                      0A09  ; SYSTEM INITIALIZATION, AND AT POWER RECOVERY TO DETERMINE THE DRIVE TYPE AND
                      0A09  ; SET UNIT PARAMETERS.
                      0A09  ;
                      0A09  ; INPUTS:
                      0A09  ;
                      0A09  ;       R3 = ADDRESS OF DRIVE CONTROL REGISTER.
                      0A09  ;       R4 = ADDRESS OF MBA CONFIGURATION STATUS REGISTER.
                      0A09  ;       R5 = DEVICE UNIT UCB ADDRESS.
                      0A09  ;
                      0A09  ; OUTPUTS:
                      0A09  ;
                      0A09  ;       THE DRIVE TYPE REGISTER IS INTERROGATED AND UNIT PARAMETERS ARE SET.
                      0A09  ;
                      0A09
                      0A09  DR_DTYPE:                                       ;CLASSIFY DRIVE TYPE AND SET PARAMETERS
          18 A3   DD  0A09          PUSHL   RM_DT(R3)                       ;READ DRIVE TYPE REGISTER
 6E   FE00 8F     AA  0A0C          BICW    #^C<^X1FF>,(SP)                 ;CLEAR EXTRANEOUS BITS
 52   F627 CF     9E  0A11          MOVAB   DR_DTDESC,R2                    ;GET ADDRESS OF DESCRIPTOR TABLE
      82   6E     B1  0A16  10$:    CMPW    (SP),(R2)+                      ;DRIVE TYPE MATCH?
           0E     13  0A19          BEQL    20$                             ;IF EQL YES
      52   0D     C0  0A1B          ADDL    #DR_DTDESCLEN-2,R2              ;ADVANCE TO NEXT ENTRY
           62     B5  0A1E          TSTW    (R2)                            ;END OF TABLE?
           F4     12  0A20          BNEQ    10$                             ;IF NEQ NO
    64 A5  10     AA  0A22          BICW    #UCB$M_ONLINE,UCB$W_STS(R5) ;SET UNIT OFFLINE
       52  0D     C2  0A26          SUBL    #DR_DTDESCLEN-2,R2              ;BACK UP TO LAST DRIVE DESCRIPTOR
    41 A5  82     90  0A29  20$:    MOVB    (R2)+,UCB$B_DEVTYPE(R5)         ;SET DEVICE TYPE
    44 A5  82     D0  0A2D          MOVL    (R2)+,UCB$L_DEVDEPEND(R5)  ;SET DISK PACK GEOMETRY
  0080 C5  82     D0  0A31          MOVL    (R2)+,UCB$L_MAXBLOCK(R5);SET MAXIMUM BLOCKS PER PACK
  008C C5  62     D0  0A36          MOVL    (R2),UCB$L_MEDIA_ID(R5)         ;SET MEDIA IDENT
           8E     D5  0A3B          TSTL    (SP)+                           ;REMOVE DRIVE TYPE FROM STACK
                  05  0A3D          RSB                                     ;
                      0A3E  DR_END:                                         ;ADDRESS OF LAST LOCATION IN DRIVER
                      0A3E
                      0A3E          .END
```

```
$$$                              = 00000020 R      02         DPT$M_SVP                        = 00000002
$$OP                             = 00000002                   DPT$REINITAB                       0000006A R      02
ACP$ACCESS                         ********   X    03         DPT$TAB                            00000000 R      02
ACP$DEACCESS                       ********   X    03         DR$DDT                             00000000 RG     03
ACP$MODIFY                         ********   X    03         DRVCLR                             00000254 R      03
ACP$MOUNT                          ********   X    03         DR_DTDESC                          0000003C R      03
ACP$READBLK                        ********   X    03         DR_DTDESCLEN                     = 0000000F
ACP$WRITEBLK                       ********   X    03         DR_DTYPE                           00000A09 R      03
APPLY_ECC                          0000038E R      03         DR_END                             00000A3E R      03
AT$_MBA                          = 00000000                   DR_FUNCTABLE                       000000B2 R      03
AVAILABLE                          00000245 R      03         DR_M_DCK                         = 00000001
CDF_AVAILABLE                    = 00000011                   DR_M_DUALPORT                    = 00000008
CDF_DIAGNOSE                     = 00000014                   DR_M_ECC_DEFER                   = 00000010
CDF_DRVCLR                       = 00000004                   DR_M_NOECC                       = 00000004
CDF_NOP                          = 00000005                   DR_M_OM                          = 00000002
CDF_OFFSET                       = 00000006                   DR_REGDUMP                         000008C0 R      03
CDF_PACKACK                      = 00000008                   DR_STARTIO                         00000146 R      03
CDF_READDATA                     = 0000000C                   DR_UNIT_INIT                       0000090A R      03
CDF_READHEAD                     = 0000000E                   DR_UNSOLNT                         000009CC R      03
CDF_READPRESET                   = 00000013                   DR_V_DCK                         = 00000000
CDF_READTRACKD                   = 00000010                   DR_V_DUALPORT                    = 00000003
CDF_RECAL                        = 00000003                   DR_V_ECC_DEFER                   = 00000004
CDF_RETCENTER                    = 00000007                   DR_V_NOECC                       = 00000002
CDF_SEARCH                       = 00000009                   DR_V_OM                          = 00000001
CDF_SEARCHA                      = 00000015                   DT$_RM03                         = 00000006
CDF_SEEK                         = 00000002                   DT$_RM05                         = 0000000F
CDF_WRITECHECK                   = 0000000A                   DT$_RM80                         = 0000000D
CDF_WRITECHECKH                  = 00000012                   DT$_RP07                         = 00000007
CDF_WRITEDATA                    = 0000000B                   DYN$C_DDB                        = 00000006
CDF_WRITEHEAD                    = 0000000D                   DYN$C_DPT                        = 0000001E
CDF_WRITETRACKD                  = 0000000F                   DYN$C_UCB                        = 00000010
CFUNC                              00000785 R      03         ECC                                00000331 R      03
CHECKRETRY                         000002E7 R      03         EMB$L_DV_REGSAV                  = 0000004E
CHECKTAB                           00000038 R      03         ENBXIT                             000006C8 R      03
CHECKXT                            00000300 R      03         ERL$DEVICERR                       ********   X    03
CRB$L_INTD                       = 00000024                   ERL$DEVICTMO                       ********   X    03
DATACHECK                          0000029A R      03         ERROR                              000006FD R      03
DC$_DISK                         = 00000001                   EXE$GL_PWRDONE                     ********   X    03
DDB$K_PACK                       = 00000001                   EXE$GL_TENUSEC                     ********   X    03
DDB$L_ACPD                       = 00000010                   EXE$GL_UBDELAY                     ********   X    03
DDB$L_DDT                        = 0000000C                   EXE$IOFORK                         ********   X    03
DEFER_ECC                          000003B4 R      03         EXE$LCLDSKVALID                    ********   X    03
DEV$M_AVL                        = 00040000                   EXE$ONEPARM                        ********   X    03
DEV$M_DIR                        = 00000008                   EXE$PWRTIMCHK                      ********   X    03
DEV$M_DUA                        = 00008000                   EXE$READ_TODR                      ********   X    03
DEV$M_ELG                        = 00400000                   EXE$SENSEMODE                      ********   X    03
DEV$M_FOD                        = 00004000                   EXE$SETCHAR                        ********   X    03
DEV$M_IDV                        = 04000000                   EXE$ZEROPARM                       ********   X    03
DEV$M_NNM                        = 00000200                   EXFNC                              00000628 R      03
DEV$M_ODV                        = 08000000                   FATALERR                           00000473 R      03
DEV$M_RND                        = 10000000                   FDISPATCH                          000001BA R      03
DEV$M_SHR                        = 00010000                   FEX                                00000556 R      03
DFUNC                              000007AC R      03         FTAB                               00000098 R      03
DIAGNOSE                           0000028A R      03         FUNCTAB_LEN                      = 00000094
DPT$C_LENGTH                     = 00000038                   FUNCXT                             0000050B R      03
DPT$C_VERSION                    = 00000004                   F_AVAILABLE                      = 00000000
DPT$INITAB                         00000038 R      02         F_DIAGNOSE                       = 0000001C
```

```
DRDRIVER                   - RM03/RM05/RM80/RP07 DISK DRIVER 1  3   15-SEP-1984 23:52:45  VAX/VMS Macro V04-00      Page  37
Symbol table                                                          6-SEP-1984 21:02:04  [DRIVER.SRC]DRDRIVER.MAR;2        (1)

F_DRVCLR                   = 00000008              IO$_UNLOAD                 = 00000001
F_NOP                      = 00000000              IO$_VIRTUAL                = 0000003F
F_OFFSET                   = 0000000C              IO$_WRITECHECK             = 0000000A
F_PACKACK                  = 00000012              IO$_WRITECHECKH            = 00000018
F_READDATA                 = 00000038              IO$_WRITEHEAD              = 0000000D
F_READHEAD                 = 0000003A              IO$_WRITELBLK              = 00000020
F_READPRESET               = 00000010              IO$_WRITEPBLK              = 0000000B
F_READTRACKD               = 0000003C              IO$_WRITETRACKD            = 0000000F
F_RECAL                    = 00000006              IO$_WRITEVBLK              = 00000030
F_RELEASE                  = 0000000A              IOC$APPLYECC                 ********  X    03
F_RETCENTER                = 0000000E              IOC$DIAGBUFILL               ********  X    03
F_SEARCH                   = 00000018              IOC$LOADMBAMAP               ********  X    03
F_SEARCHA                  = 00000018              IOC$MNTVER                   ********  X    03
F_SEEK                     = 00000004              IOC$RELCHAN                  ********  X    03
F_WRITECHECK               = 00000028              IOC$REQCOM                   ********  X    03
F_WRITECHECKH              = 0000002A              IOC$REQPCHANL                ********  X    03
F_WRITEDATA                = 00000030              IOC$RETURN                   ********  X    03
F_WRITEHEAD                = 00000032              IOC$UPDATRANSP               ********  X    03
F_WRITETRACKD              = 00000034              IOC$WFIKPCH                  ********  X    03
GO                           00000575 R      03    IRP$L_MEDIA                = 00000038
IDB$L_OWNER                = 00000004              IRP$L_SVAPTE               = 0000002C
IMMED                        000005A6 R      03    IRP$S_FCODE                = 00000006
IO$V_COMMOD                = 00000006              IRP$V_FCODE                = 00000000
IO$V_DATACHECK             = 0000000E              IRP$V_FUNC                 = 00000001
IO$V_DIAGNOSTIC            = 00000008              IRP$V_PHYSIO               = 00000008
IO$V_INHRETRY              = 0000000F              IRP$W_BCNT                 = 00000032
IO$V_INHSEEK               = 0000000C              IRP$W_FUNC                 = 00000020
IO$V_MOVETRACKD            = 00000007              IRP$W_STS                  = 0000002A
IO$V_SKPSECINH             = 00000009              LDCYL                        00000622 R      03
IO$_ACCESS                 = 00000032              MASKH                      = 00000008
IO$_ACPCONTROL             = 00000038              MASKL                      = 04000000
IO$_AVAILABLE              = 00000011              MBA$L_BCR                  = 00000010
IO$_CREATE                 = 00000033              MBA$L_CR                   = 00000004
IO$_DEACCESS               = 00000034              MBA$L_CSR                  = 00000000
IO$_DELETE                 = 00000035              MBA$L_ERB                  = 00000400
IO$_DIAGNOSE               = 0000001D              MBA$L_MAP                  = 00000800
IO$_DRVCLR                 = 00000004              MBA$L_SR                   = 00000008
IO$_MODIFY                 = 00000036              MBA$L_VAR                  = 0000000C
IO$_MOUNT                  = 00000039              MBA$M_CR_ABORT             = 00000002
IO$_NOP                    = 00000000              MBA$M_CR_IE                = 00000004
IO$_OFFSET                 = 00000006              MBA$M_CR_INIT              = 00000001
IO$_PACKACK                = 00000008              MBA$M_ERROR                = 000E5FFF
IO$_READHEAD               = 0000000E              MBA$M_SR_DLT               = 00000800
IO$_READLBLK               = 00000021              MBA$M_SR_ERCONF            = 00000008
IO$_READPBLK               = 0000000C              MBA$M_SR_INVMAP            = 00000010
IO$_READPRESET             = 00000019              MBA$M_SR_ISTO              = 00000002
IO$_READTRACKD             = 00000010              MBA$M_SR_MAPPE             = 00000020
IO$_READVBLK               = 00000031              MBA$M_SR_MBEXC             = 00000080
IO$_RECAL                  = 00000003              MBA$M_SR_MCPE              = 00020000
IO$_RELEASE                = 00000005              MBA$M_SR_MDPE              = 00000040
IO$_RETCENTER              = 00000007              MBA$M_SR_MXF               = 00000100
IO$_SEARCH                 = 00000009              MBA$M_SR_NED               = 00040000
IO$_SEEK                   = 00000002              MBA$M_SR_PGE               = 00080000
IO$_SENSECHAR              = 0000001B              MBA$M_SR_RDS               = 00000004
IO$_SENSEMODE              = 00000027              MBA$M_SR_RDTO              = 00000001
IO$_SETCHAR                = 0000001A              MBA$M_SR_SPE               = 00004000
IO$_SETMODE                = 00000023              MBA$M_SR_WCKLWR            = 00000200
```

```
MBA$M_SR_WCKUPR                 = 00000400               RM_ER1_V_HCRC                   = 00000008
MBA$V_SR_NED                    = 00000012               RM_ER1_V_OPI                    = 0000000D
NOP                               00000254 R     03      RM_ER1_V_UNS                    = 0000000E
NORMAL                            000002FD R     03      RM_ER1_V_WLE                    = 0000000B
OFF                               000003B9 R     03      RM_ER2                            00000034
OFFSET                            00000254 R     03      RM_ER2_M_BSE                    = 00008000
OFFSIZ                          = 00000004               RM_ER2_M_DPE                    = 00000008
OFFTAB                            000000AE R     03      RM_ER2_M_DVC                    = 00000080
PACKACK                           0000024E R     03      RM_ER2_M_IVC                    = 00001000
POSIT                             0000061C R     03      RM_ER2_M_LBC                    = 00000400
PR$_IPL                         = 00000012               RM_ER2_M_LSC                    = 00000800
READDATA                          0000027C R     03      RM_ER2_M_OPE                    = 00002000
READHEAD                          0000027C R     03      RM_ER2_V_BSE                    = 0000000F
READPRESET                        00000254 R     03      RM_ER2_V_SKI                    = 0000000E
READTRACKD                        00000261 R     03      RM_ER2_V_SSE                    = 00000005
RECAL                             00000254 R     03      RM_LA                             0000001C
RELEASE                           00000254 R     03      RM_MR                             0000000C
RESETXFR                          000008A1 R     03      RM_MR2                            00000030
RETCENTER                         00000254 R     03      RM_MR_M_DM                      = 00008000
RETREG                            000006CB R     03      RM_OF                             00000024
RETRY                             0000032E R     03      RM_OF_M_CMO                     = 00008000
RETRYERR                          00000441 R     03      RM_OF_M_FMT                     = 00001000
RM_AS                             00000010               RM_OF_M_HCI                     = 00000400
RM_CS1                            00000000               RM_OF_M_MTD                     = 00004000
RM_CS1_M_GO                     = 00000001               RM_OF_M_SSEI                    = 00000200
RM_DA                             00000014               RM_OF_V_SSEI                    = 00000009
RM_DC                             00000028               RM_SN                             00000020
RM_DS                             00000004               RM_UNUSED                         0000002C
RM_DS_M_DPR                     = 00000100               SAFUNC                            00000777 R     03
RM_DS_M_ERR                     = 00004000               SEARCH                            00000254 R     03
RM_DS_V_DPR                     = 00000008               SEARCHA                           000005F9 R     03
RM_DS_V_ERR                     = 0000000E               SEEK                              00000254 R     03
RM_DS_V_MOL                     = 0000000C               SEIZE                             000005BD R     03
RM_DS_V_VV                      = 00000006               SIZ...                          = 00000001
RM_DT                             00000018               SPECOND                           00000848 R     03
RM_DT_V_DRQ                     = 0000000B               SS$_CTRLERR                     = 00000054
RM_ECT                            00000038               SS$_DATACHECK                   = 0000005C
RM_EC2                            0000003C               SS$_DRVERR                      = 0000008C
RM_ER1                            00000008               SS$_FORMAT                      = 000000BC
RM_ER1_M_AOE                    = 00000200               SS$_IVADDR                      = 00000134
RM_ER1_M_DCK                    = 00008000               SS$_MEDOFL                      = 000001A4
RM_ER1_M_DTE                    = 00001000               SS$_NONEXDRV                    = 000001C4
RM_ER1_M_ECH                    = 00000040               SS$_NORMAL                      = 00000001
RM_ER1_M_FER                    = 00000010               SS$_OPINCOMPL                   = 000002D4
RM_ER1_M_HCE                    = 00000080               SS$_PARITY                      = 000001F4
RM_ER1_M_HCRC                   = 00000100               SS$_TIMEOUT                     = 0000022C
RM_ER1_M_IAE                    = 00000400               SS$_UNSAFE                      = 0000023C
RM_ER1_M_ILF                    = 00000001               SS$_VOLINV                      = 00000254
RM_ER1_M_ILR                    = 00000002               SS$_WASECC                      = 00000639
RM_ER1_M_OPI                    = 00002000               SS$_WRITLCK                     = 0000025C
RM_ER1_M_PAR                    = 00000008               TRANNOCH                          00000290 R     03
RM_ER1_M_RMR                    = 00000004               TRANRQCH                          0000028A R     03
RM_ER1_M_UNS                    = 00004000               TRANXT                            00000303 R     03
RM_ER1_M_WCF                    = 00000020               UCB$B_CEX                       = 00000093
RM_ER1_M_WLE                    = 00000800               UCB$B_DEVCLASS                  = 00000040
RM_ER1_V_FER                    = 00000004               UCB$B_DEVTYPE                   = 00000041
RM_ER1_V_HCE                    = 00000007               UCB$B_DIPL                      = 0000005E
```

```
UCB$B_DR_ERL                      000000D5
UCB$B_DR_SSTS                     000000D4
UCB$B_ERTCNT                    = 00000080
UCB$B_ERTMAX                    = 00000081
UCB$B_FEX                       = 00000092
UCB$B_FIPL                      = 0000000B
UCB$B_OFFNDX                    = 000000CA
UCB$B_OFFRTC                    = 000000CB
UCB$B_SECTORS                   = 00000044
UCB$B_SLAVE                     = 00000090
UCB$K_DR_LENGTH                 = 000000DC
UCB$K_LCC_DISK_LENGTH           = 000000CC
UCB$L_CRB                       = 00000024
UCB$L_DEVCHAR                   = 00000038
UCB$L_DEVCHAR2                  = 0000003C
UCB$L_DEVDEPEND                 = 00000044
UCB$L_DPC                       = 0000009C
UCB$L_DR_BCR                      000000D8
UCB$L_DR_SR                       000000CC
UCB$L_IRP                       = 00000058
UCB$L_MAXBLOCK                  = 000000B0
UCB$L_MEDIA_ID                  = 0000008C
UCB$L_SVAPTE                    = 00000078
UCB$M_ONLINE                    = 00000010
UCB$M_POWER                     = 00000020
UCB$M_TIMOUT                    = 00000040
UCB$M_VALID                     = 00000800
UCB$V_BSY                       = 00000008
UCB$V_ECC                       = 00000000
UCB$V_ONLINE                    = 00000004
UCB$V_POWER                     = 00000005
UCB$V_VALID                     = 0000000B
UCB$W_BCNT                      = 0000007E
UCB$W_DA                        = 000000BC
UCB$W_DC                        = 000000BE
UCB$W_DEVBUFSIZ                 = 00000042
UCB$W_DEVSTS                    = 00000068
UCB$W_DR_ER2                      000000D0
UCB$W_DR_MR                       000000D2
UCB$W_DR_OFR                      000000D6
UCB$W_ECT                       = 000000C4
UCB$W_EC2                       = 000000C6
UCB$W_FUNC                      = 0000009A
UCB$W_OFFSET                    = 000000C8
UCB$W_STS                       = 00000064
UCB$W_UNIT                      = 00000054
UNLOAD                            00000245 R      03
VEC$L_IDB                       = 00000008
WRITECHECK                        00000271 R      03
WRITECHECKH                       00000271 R      03
WRITEDATA                         00000277 R      03
WRITEHEAD                         00000277 R      03
WRITETRACKD                       0000025C R      03
XFER                              0000060D R      03
```

```
                                                +----------------+
                                                ! Psect synopsis !
                                                +----------------+

PSECT name                      Allocation          PSECT No.  Attributes
----------                      ----------          ---------  ----------
.  ABS  .                       00000000  (     0.)  00 (  0.)  NOPIC    USR    CON    ABS    LCL NOSHR NOEXE NORD   NOWRT NOVEC BYTE
$ABS$                           000000DC  (   220.)  01 (  1.)  NOPIC    USR    CON    ABS    LCL NOSHR   EXE   RD     WRT NOVEC BYTE
$$$105_PROLOGUE                 00000070  (   112.)  02 (  2.)  NOPIC    USR    CON    REL    LCL NOSHR   EXE   RD     WRT NOVEC BYTE
$$$115_DRIVER                   00000A3E  (  2622.)  03 (  3.)  NOPIC    USR    CON    REL    LCL NOSHR   EXE   RD     WRT NOVEC LONG

                                             +------------------------+
                                             ! Performance indicators !
                                             +------------------------+

Phase                    Page faults    CPU Time       Elapsed Time
-----                    -----------    --------       ------------
Initialization                    31    00:00:00.04    00:00:03.11
Command processing               109    00:00:00.38    00:00:05.85
Pass 1                           605    00:00:19.66    00:01:54.25
Symbol table sort                  0    00:00:02.56    00:00:22.81
Pass 2                           331    00:00:04.67    00:00:31.08
Symbol table output               47    00:00:00.23    00:00:00.56
Psect synopsis output              2    00:00:00.01    00:00:00.25
Cross-reference output             0    00:00:00.00    00:00:00.00
Assembler run totals            1127    00:00:27.57    00:02:57.92

The working set limit was 2250 pages.
159994 bytes (313 pages) of virtual memory were used to buffer the intermediate code.
There were 130 pages of symbol table space allocated to hold 2372 non-local and 84 local symbols.
1856 source lines were read in Pass 1, producing 24 object records in Pass 2.
48 pages of virtual memory were used to define 45 macros.

                                            +--------------------------+
                                            ! Macro library statistics !
                                            +--------------------------+

Macro library name                           Macros defined
------------------                           --------------
_$255$DUA28:[SYS.OBJ]LIB.MLB;1                         30
_$255$DUA28:[SYSLIB]STARLET.MLB;2                      10
TOTALS (all libraries)                                 40

2486 GETS were required to define 40 macros.

There were no errors, warnings or information messages.

MACRO/LIS=LIS$:DRDRIVER/OBJ=OBJ$:DRDRIVER MSRC$:DRDRIVER/UPDATE=(ENH$:DRDRIVER)+EXECML$/LIB
```

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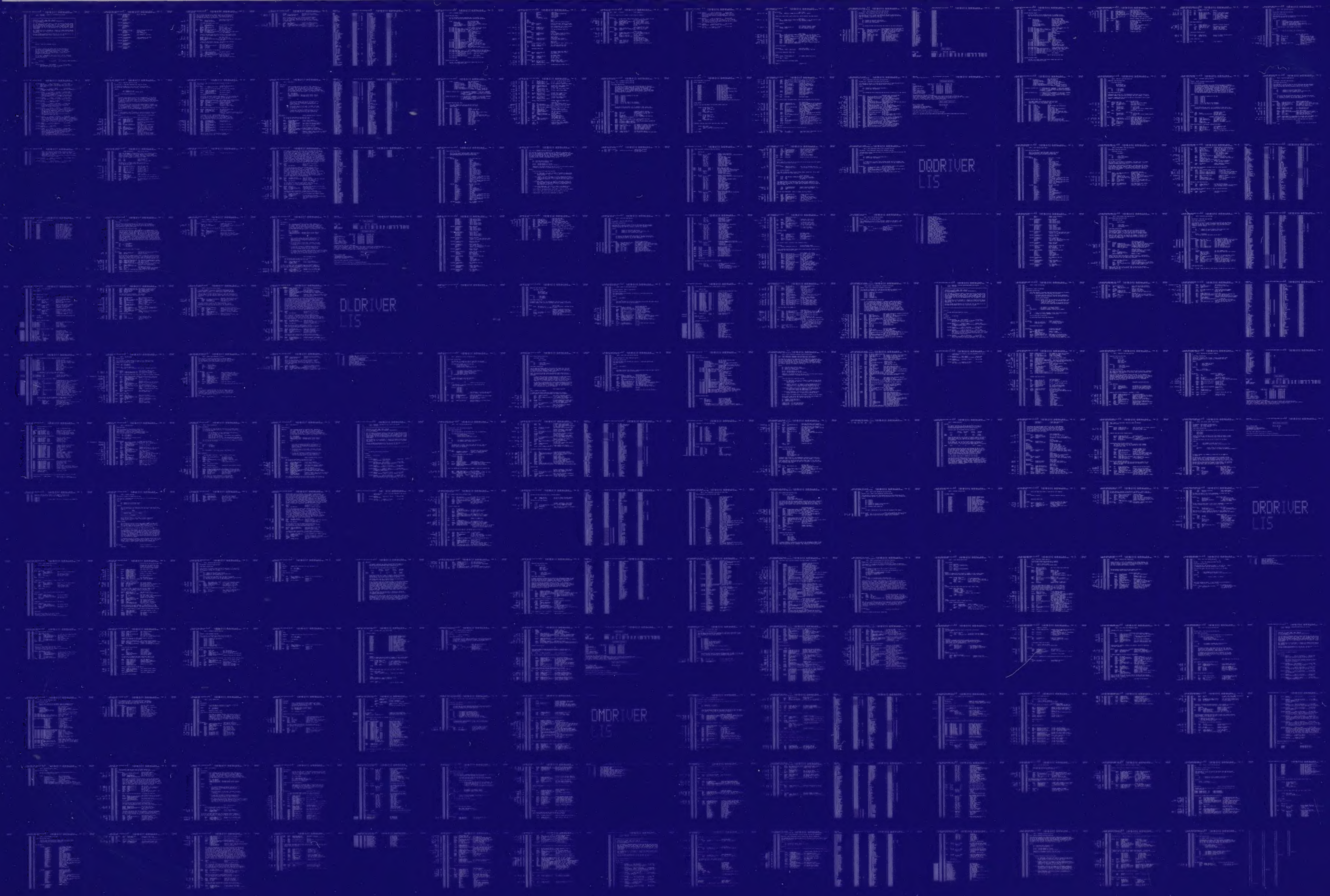

DQDRIVER
LIS

DLDRIVER
LIS

DRDRIVER
LIS

DMDRIVER
LIS

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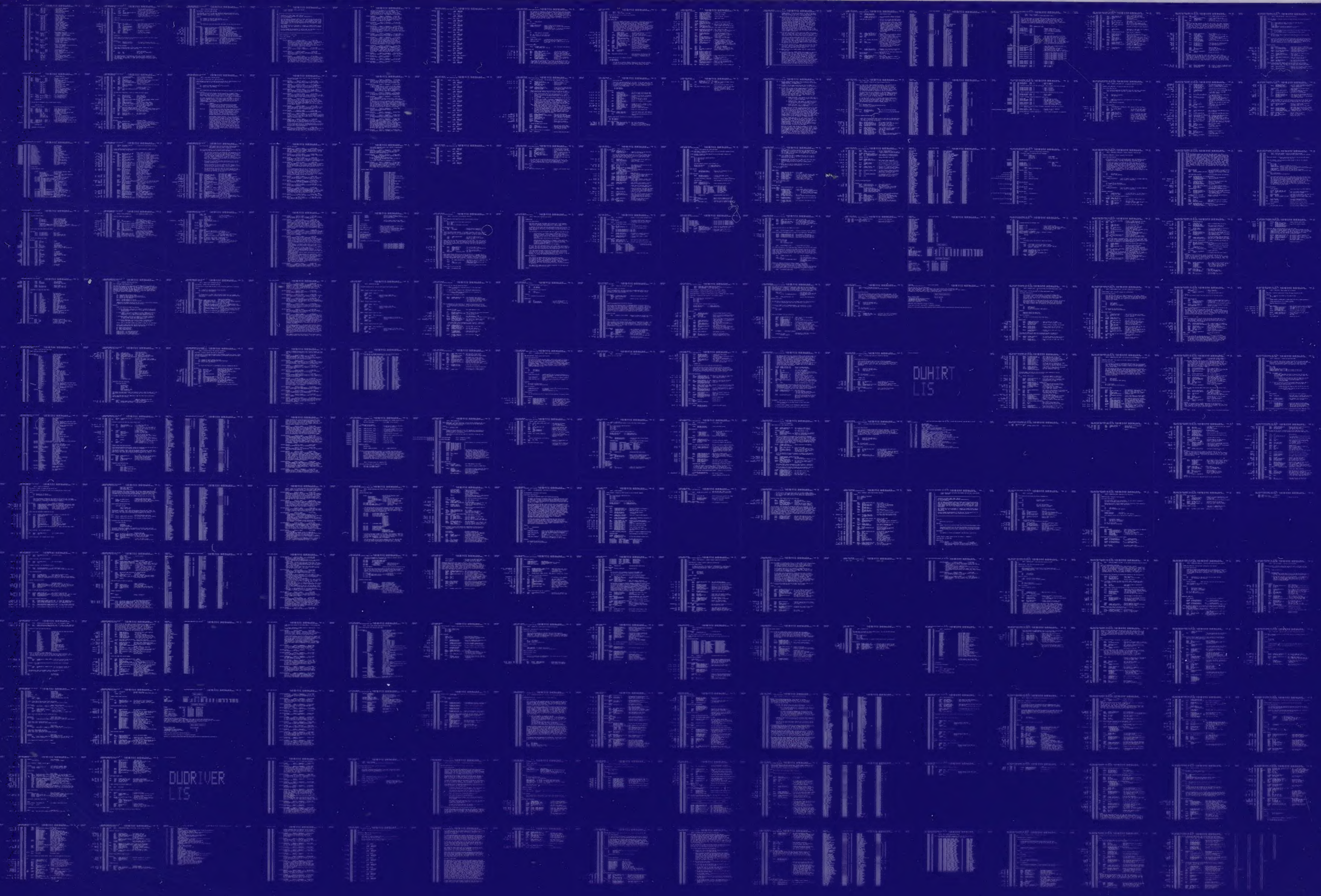

DUHIRT
LIS

DUDRIVER
LIS